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# The Canadian Entomologist

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# *NOTES ON AMERICAN HEMIPTERA.*

BY DR. E. BERGROTH, TURTOLA, FINLAND.

## II.

(Continued from Vol. XXXVIII, 1906, p. 202).

### Aradidæ

1. *Aradus aequalis* Say.—Mr. Heidemann has sent me a specimen of *A. duryi* Osb., communicated to him by Mr. Dury. I quite agree with Heidemann in considering this species a synonym of *aequalis*.

2. *Aradus montanus*, n. sp.—Ovate (♀), finely granulated, uniformly dark brownish black including legs and antennæ. Head somewhat longer than broad and as long as the pronotum in the middle, with two parallel longitudinal impressions, the tubercle near the anterior angle of the eyes low and obtuse, antenniferous spines a little divergent, not quite reaching the middle of the first antennal joint and with a small tooth on their outer margin, rostrum reaching the anterior coxæ, antennæ moderately robust, a little more than half as long again as the head, second joint 2½ times longer than first and a little longer than half the breadth of the head (including eyes), a little thicker at apex than at base, third and fourth joints taken together scarcely longer than second, third joint a little thicker than second, fourth conspicuously narrower and shorter than third. Pronotum kidney-shaped but with a short lobelet anteriorly on each side near the neck of the head, a little narrower than the hemelytra between their dilated subbasal part and a little more than twice broader than long in the middle, its greatest width in the middle where the lateral margins are rather broadly rounded and from where they are strongly convergent toward the apex, much less so toward the base, the whole lateral margins distinctly crenate, the four median discal ridges subequally distant at their base, the inner pair reaching the anterior margin, thicker and more approximated before the middle, the outer pair not reaching the apical margin. Scutellum a little longer than the pronotum in the middle, with a blunt median longitudinal keel in the basal half, the lateral margins convergent from the base to beyond the middle, then slightly rounded to the apex. Hemelytra (♀) slightly passing the base of the dorsal genital segment, exocorium moderately dilated and reflected in

its basal part, mesocorium with a single oblique transverse ridge behind the middle, endocorium without distinct transverse ridges, membrane scarcely reticulate. Abdomen (♀) one-third broader than the pronotum, with the apical angles of the segments very slightly obtusely prominent, those of the fifth segment more distinctly so and those of the sixth segment strongly prominent owing to the lateral margin being deeply arcuately indented between the apex of this segment and the base of the genital lobes; sixth ventral segment in the middle scarcely longer than the fifth and than the two genital segments combined, its apical angles reaching the transverse level of the apex of the second genital segment which is half the length of the first, apical margin of dorsal genital segment notched in the middle, genital lobes convergent, approximated interiorly, their inner margin strongly rounded, the outer margin slightly rounded with a short tooth-like process in the basal half. Length, ♀ 8 mm.

Colorado (Leadville, 10,000—11,000 ft.: H.F. Wickham).—Coll. Schouteden. A plain-looking species, but not closely allied to any described North American form.

3. *Aradus curticollis*, n. sp.—Broadly ovate (♂), finely and thickly granulated, jet-black, membrane brown, third antennal joint of dirty whitish color, anterior and intermediate tibiæ paler in the middle. Head a little longer than broad, vertex with two longitudinal impressions which are slightly divergent forwards, eyes very prominent, substylated and directed a little upwards, intra-ocular tubercle scarcely perceptible, antenniferous spines slightly divergent, reaching beyond the middle of the first antennal joint, without a tooth on their outer margin, rostrum reaching fore coxæ, antennæ almost fusiform, incrassated in the middle and equally tapering toward base and apex, as long as head and pronotum together, first joint rather narrower, second joint as long as the breadth of the head (with the eyes) and considerably longer than the last two joints combined, cylindrically incrassate from apex to beyond middle, then moderately narrowed toward base, third joint cylindrical, narrower than apex of second and not much more than one-third its length, suddenly narrowed at base, fourth joint narrower and conspicuously shorter than third. Pronotum with entire, not crenulated lateral margins, distinctly shorter than head and three times broader than long, a little narrower than the hemelytra between their dilated subbasal part, its greatest width before the middle from which point the lateral margins are very strongly convergent to the apical angles and moderately roundedly convergent toward the base, the two median ridges parallel, reaching apical margin, the following pair at the base more distant from the median ridges than these from each other, a little convergent anteriorly, not reaching anterior margin,

ending in a flattened tubercle, the outermost (humeral) ridges very short, nodiform. Scutellum three-fourths longer than pronotum in the middle, with a transverse tubercle before the middle, lateral margins broadly and slightly rounded. Hemelytra (♂) reaching the apical lobes of the abdomen, roundedly dilated and reflected near base, exocorium and endocorium with some transverse ridges, mesocorium with a single oblique transverse ridge behind the middle. Abdomen three times broader than the membrane, apical angles of fifth segment very slightly obtusely prominent, male genital lobes obliquely slightly rounded at apex, meeting interiorly. Length, ♂ 5.8 mm.

North Carolina (Southern Pines: A. H. Manse).—Coll. de la Torre Bueno. A very distinct species, somewhat allied to the quite differently coloured *A. behrensi* Bergr., but more broadly ovate with longer and less incrassate antennæ and much shorter pronotum having the two median keels much more approximate at base. I have not seen the female, but the abdomen is probably not or not much broader in this sex. *A. cincticornis* Bergr. and *curticollis* Bergr. belong to the very few *Aradus* species having the abdomen broadly ovate also in the male.

4. *Aradus cincticornis* Bergr.—This species stands in some collections under the unpublished name *A. nasutus* Uhl.

5. *Aradus tuberculifer* Kirby.—Black, sometimes tinged with greyish brown, apical margin of connexival segments yellowish, corium with a dark luteous costal patch before the middle, this patch being sometimes diffused over a large part of the corium, legs fuscous black. Head distinctly longer than broad with a U-shaped impression above, intraocular tubercle distinct, antenniferous spines a little divergent with a small tooth, sometimes indistinct or wanting, on the outer margin, rostrum reaching or slightly passing the anterior margin of the mesosternum, second joint of antennæ a little shorter than the head, almost linear from the base to the middle, then strongly and rather suddenly clavately incrassate, third joint a little shorter than half the length of the second joint, incrassate, even thicker than the apex of the second joint, parallel-sided except at the constricted base, fourth joint distinctly shorter and a little thinner than the third. Pronotum two and one-half times broader than long in the middle, lateral margins very finely crenulate or almost smooth, antero-lateral margins slightly sinuate, the four median discal keels parallel, the inner ones approximated in their anterior half, the outer ones abbreviated before the middle; the greatest width of the pronotum is immediately behind the middle, from which point the lateral margins are very distinctly convergent towards the base. Scutellum subtriangular, a little longer than the pronotum in the middle, with a blunt median tubercle. Hemelytra (♀) passing the base of

the dorsal genital segment, costal margin of corium moderately ampliated toward the base, veins of membrane narrowly bordered with white. Female dorsal genital segment triangularly narrowing toward the apex, leaving the apical lobes free and separated from them by a fine suture. Discal lobes of the sixth female ventral segment distinctly longer than those of the fifth segment, either lobe considerably longer than broad, rounded at apex, taken together broader than long, first ventral genital segment about half the length of the sixth ventral segment, the apical lobes convergent, rounded at the external margin and at the apex, almost twice longer than broad. Length, ♀ 7.3 mm.

*A. tuberculifer* Kirby in Richardson, Fauna Bor. Amer. IV., 278, pl. VI., fig. 5 (1837).

*A. caliginosus* Walk., Cat. Hem. Het. Brit. Mus. VII., 36 (1873).

This is a Boreal species which has hitherto been recorded only from Canada and even there it seems to be rare. From the United States I have seen but one specimen, taken in Colorado (probably in the high mountains) by Morrison, and the species has apparently remained unknown to Uhler and Heidemann. It is closely allied to but specifically distinct from the Palearctic *A. crenaticollis* F. Sahlb.

6. *Aradus funestus*, n. sp —Black, apical margin or at least apical angle of connexival segments yellowish, corium with a more or less distinct yellow costal spot before the middle. Antennæ thin, second and third joints slightly and gradually incrassated from the base to the apex, third joint about one-third the length of the second, fourth joint equal to third in length and thickness. Pronotum twice broader than long in the middle, the lateral margins parallel from the middle to the base. Scutellum pentagonal, as long as the pronotum in the middle, the lateral margins parallel from the base to the middle. Hemelytra reaching the apex of the dorsal genital segment, costal margin of corium scarcely (♂) or slightly (♀) ampliated toward the base. Female dorsal genital segment dilated toward the very broad apex, laterally covering the basal part of the apical lobes, reaching almost to their outer margin, its apical margin broadly rounded. Apical lobes of the genital segment seen from the ventral side at least twice longer than broad. Other characters as in *A. tuberculifer*. Length, ♂ 57 mm., ♀ 7– 7.5 mm.

This species is common in Canada as well as in the Northern U. S. from the Atlantic to the Pacific ocean, and I have also seen a specimen from Colorado. In the various writings of Prof. Uhler it is recorded under the name *tuberculifer* Kirby; and under this name it stands in most if not all American collections. Kirby's description fits both these species equally well. Fortunately he had

figured his species, clearly showing the structure of the antennæ. There can thus be no doubt as to which of the two species he had before him.

7. *Aradus lugubris* Fall.—In his Catalogue of the Heteroptera of the British Museum, Walker described as new an *Aradus fenestratus*, founding the species on many specimens from St. Martin's Falls, Albany River, Hudson's Bay, and from Nova Scotia, and on two specimens from the Rocky Mountains. In his Revision of Walker's Aradidæ Distant marked *fenestratus* as a good species, and in arranging the Aradids of that Museum Distant has apparently left the types of this species in the same state as Walker, as I stated when I examined them a year ago. The first specimen bears a round label with the word "type" upon it and belongs to *lugubris* to which also several other specimens appertain, but intermixed with them are a few specimens of *Aradus abbas* Bergr., easily recognized by the very slender antennæ narrowly biannulated with white. Walker's description exclusively refers to *lugubris*, of which *fenestratus* should be cited as a synonym.

Gen. *Calisius* Stal.

To the characters of this genius should be added: Metanotum et segmentum primun (verum) dorsale abdominis ad latera corporis visibilia. Orificia distincta, punctiformia, mox ante coxas posticas sita.

In all species of this genus the scutellum is constricted in the middle, but the margins appear to be straight owing to the linear corium being so closely attached to the scutellum that it seemingly forms a part of it. The connexivum in this genus is split from the lateral margin, being, as Champion correctly observed, "divided into two parts, a dorsal and ventral," but these are not always similarly armed, as will be seen from the descriptions given below. To get a correct view of the manner in which the connexivum is armed it is necessary to examine the upper lateral margin at a right angle to the margin (thus more or less horizontally, as the margin is more or less reflected) and the lower lateral margin obliquely from above, lest the tubercles of the ventral lateral margin will make the impression of being situated on the dorsal lateral margin.

8. *Calisius elegantulus*, n. sp.—Subelongately ovate (♀), light brownish testaceous, last antennal joint fuscous, scutellum with two transverse oblique black spots immediately behind the basal callosity at the median ridge and a cretaceous streak on each side between the black subbasal spot and the lateral sinuosity, the first connexival segment whitish testaceous, the three following segments infuscated, the three last segments with a whitish bloom and a small rectangular denudated fuscous spot before the middle. Head considerably longer than broad and longer than the

pronotum, granulated, with short longitudinal fuscous impression on either side within the eyes, antennæ much shorter than the head, the first three joints subequal in length, third reaching apex of head, narrower than second, fourth joint incrassated, longer and thicker than second. Pronotum on the anterior lobe with two strongly convergent waved keels, each bearing a black tubercle, on the posterior lobe with four short ridges, each bearing a brown tubercle. Scutellum rather strongly and densely punctured with a series of three or four black granules immediately within the lateral sinuosity, apex unarmed, the basal elevation broadly crescent-shaped, three times broader than long, granulated and with two small broadly separated black tubercles at the very base, partly overlapping the pronotal basal margin; a short faint oblique ridge between each side of the basal elevation and the scutellar margin; the median scutellar keel slightly granulated, narrowing toward apex. Abdomen with the first connexival segment but slightly narrower exteriorly than interiorly, the posterior margin of this segment scarcely oblique, the upper lateral margin of the three following segments with two short apically subtruncate lobes, anterior lobe blackish, posterior brown, upper lateral margin of all subsequent segments with two tubercles, anterior tubercle black, posterior pale, the lower lateral margin of all segments (first excepted) with three tubercles, the middle one of which is black, the others being pale. Legs pale testaceous, a submedian ring to femora and tibia, apex of tibiæ, and tarsi fuscous. Length, ♀ 3.7 mm.

Guadeloupe Island, West Indies; communicated by Mons. A. Montandon.

Allied to *C. pallidipes* Stal, but with differently constructed antennæ and differently coloured scutellum and legs.

9. *Calisius contubernalis* n. sp.—Oblong (♀), fuscous-ochraceous, sometimes darker, last antennal joint fuscous, first connexival segment whitish ochraceous. Head a little longer than broad, granulated, the apical process with a lateral impression, antennæ as long as the head, first joint slightly passing apex of antenniferous spines, second joint as long as first and almost reaching apex of head, third joint as thick as and a little longer than second, fourth joint thicker and somewhat longer than third, rostrum almost reaching base of head. Pronotum slightly shorter than the head, the posterior lobe finely and rather thickly punctured, with four keels, the two median ones parallel, the outer pair strongly convergent and continued over the anterior lobe where they are granulated, reaching the apical margin. Scutellum rather more strongly punctured than the posterior pronotal lobe, with a series of five black granules immediately within the lateral sinuosity and a transverse series of 8 or 9 such granules close to the apical margin, the median carina granulated, attenuated toward apex, at the base

forming a triangular elevation bearing three small tubercles (placed in a triangle) on each side and emitting a short oblique granulated ridge to the lateral margins. Sternum scarcely granulated. Abdomen with the first connexival segment forming a transverse triangle the apex of which reaches the lateral margin and the posterior margin of which is oblique; the upper lateral margin of all the following segments with two very short lobelets, anterior lobule brown, posterior pale, the lower lateral margin of all segments (first excepted) with three small tubercles, the median one blackish, the others pale; last dorsal segment in the male subquadrately elevated and granulated in the middle, dorsal male genital segment very short, transversely sublinear, venter scarcely granulated, fifth male segment arcuately sinuated in the middle almost to the base, sixth segment also deeply arcuately sinuate in the middle, yet scarcely shorter there than at the sides, first genital segment as long as sixth ventral segment, broadly sinuate at apex, the apical angles with a short upturned cylindrical process not reaching the apical angles of the last ventral segment, second genital segment shortly protruding beyond the dorsal genital segment, with two small teeth or granules at apex, on the underside divided into three lobes by two longitudinal impressions, the median lobe narrower than the somewhat tumid lateral lobes. Legs ochraceous, in dark specimens somewhat infuscated. Length, ♂ 3.7–3.8 mm.

St. George Island, Florida; Guadeloupe Island, W. T.

At once distinguished from *C. elegantulus*, apart from colour, by the structure of the antennæ, the sculpture of the scutellum, the form of the first connexival segment, etc. The structure of the antennæ and scutellum also separates it from *C. pallidipes*.

The male type from Florida, taken by Mr. Pergande, is in the Washington Museum; the female cotypes from Gualeloupe have been communicated by Dr. H. Schouteden.

10. *Calisius anaemus*, n. sp.—Closely allied to the preceding species, but entirely very pale ochraceous without darker markings and with all granules and tubercles as pale as the ground-colour. The very short first joint of antennæ reaching apex of antenniferous spines (remaining joints wanting). The two convergent keels of the anterior pronotal lobe connected at apex by a short transverse ridge. Scutellum close to apical margin without the transverse series of small tubercles, but the apical margin itself distinctly crenulated. Underside of body very finely and thickly granulated. First male genital segment a little shorter than sixth ventral segment, the apical margin a little sinuate in the middle. Second male genital segment with the median lobe very narrowly triangular. Length, ♂ 3.8 mm.

Biscayne, Florida.

This species was determined as *C. pallidipes* Stal by Uhler and was recorded under this name by Heidemann in Proc. Ent. Soc. Wash. VI., p. 229. The specimen is a ♂, not a ♀, as Heidemann says. Stal's species (from Rio Janeiro) is a darker, brown-speckled insect with differently sculptured pronotum and scutellum.

11. *Calisius major*, n. sp.—Oblong-ovate (♂), dark testaceous, scutellum (except basal elevation and median keel) whitish cinereous with a large median area and the apex sprinkled with fuscous and with an oblique black fascia on each side immediately behind the basal elevation, last dorsal segment and upper side of the protruding male apical genital segment blackish. Head slightly longer than broad, antennæ scarcely longer than the head, rather stout, first two joints short, second a little thicker and more oval than the first, third joint much the longest, thicker and more than three times longer than the second, attenuated at the base, fourth joint as thick as the third and more than twice longer than the second Pronotum a little shorter than head, anterior lobe remotely granulated, posterior lobe with four keels, the two median keels convergent from base to apex, the outer keels almost parallel, slightly convergent apically, the lateral margins of the lobe also somewhat elevated. Scutellum superficially and concolorously punctate, the transversely triangular basal elevation at its base on each side with two short keels, the outer one of which is obliquely continued to the scutellar lateral margin, the median scutellar ridge scarcely granulated, attenuated toward apex, the lateral margins immediately within the sinuosity with a series of three black granules, the apical margin neither granulated nor crenulated. Abdomen with the lateral margins of all the seven connexival segments provided with two tubercles, the anterior black, the posterior pale and sometimes notched, last male dorsal segment transversely convex, its apical margin sinuate, the apical male genital segment protruding considerably beyond the extremely short dorsal genital segment. Legs pale testaceous. Length, ♂ 4 mm.

Venezuela (La Guayra); in my collection.

Readily distinguished from all other species by the structure of the antennæ and other characters. The specimen being strongly carded I am unable to describe the ventral genital segments.

12. *Proxius gypsatus* Bergr.—Of this species, described from Venezuela and also found in Panama and Guatemala, I have seen two specimens from Florida; one is without precise locality, the other from St. Augustine and bears the label *Syrtidea diffracta* Uhl., apparently an unpublished name. Two species of *Proxius* are now known from Florida.

## A NEW SPECIES OF CALISIUS.

BY DR. E. BERGROTH, TURTOLA, FINLAND.

*Calisius annulicomis*, n. sp.

Ovatus (♀), fuscus, pronoto fusco-nigro, scutello subtestaceo, medio vittis duabus albis antrorsum leviter convergentibus, antice arcuato-conjunctis, postice extrorsum curvatis et latera attingentibus signato, inter has vittas et elevationem basalem nigram fusco-conspurcato, carina media nigra, medio late albo-interrupta, abdomine magna parte obscure rufescente, subtus latera versus parce albo-granulato, antennis fuscis, articulo tertio (ima basi excepta) flavo, articulo quarto nigro, pedibus sordide flavidis, femoribus (ima basi et summo apice exceptis) fuscis. Caput pronoto distincte brevius, antennis capiti subaeque longis, articulo secundo primo crassiore et paullo longiore, tertio secundo fere dimidio longiore, quarto tertio sat multo longiore et crassiore. Pronotum lateribus rectis, irregulariter nigro-spinulosis, medio vix sinuatis insigne, lobo postico carinis sex instructo, duabus mediis antrorsum leviter convergentibus, usque in lobum anticum extensis, carinis subsequentibus in parte basali levius, deinde fortiter convergentibus et usque ad apicem carinarum mediarum extensis, cum his angulum acutum formantibus, carinis extimis prope marginem lateralem sitis. Carina media scutelli granulata. Margo lateralis superior segmentorum connexivi granulis tribus perminutis, margo lateralis inferior granis tribus majoribus albis instructi. Long. ♀ 4 mm.

Tasmania (Launcestown, J. J. Walker). Mus. Brit.

This remarkable species is by many characters very distinct from *C. interveniens* Bergr., the only Australian species hitherto known.

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## THE NORTH AMERICAN SPECIES OF THE GENERA ARTHROPEAS AND ARTHROCERAS.

BY CHARLES W. JOHNSON, BOSTON, MASS.

The species *Arthropeas leptis* Osten Sacken seems to be the cause of some confusion in these two genera. This is probably due to the comparative scarcity of material, to an oversight in Aldrich's Catalogue, and to the fact that Osten Sacken in describing the species and referring to a number of minor characters wherein it differs from the typical *Arthropeas* failed to mention the most important feature—the absence of spurs on the anterior tibiæ. This character, however, he mentions in 1882 (Berl. Ent. Zeits., XXVI, 365), as follows: "In the notes to my Catal. N. Am. Dipt., 1878 (p. 223), an insect is described which I referred provisionally to the genus Arthropeas. It has the body of a Leptid (Symphoromyia), with the antennæ of a Cœnomyia. It will probably form a new

genus because, besides the differences in the venation noticed by me in the description, it has no spurs on the front tibiæ, while such spurs are distinct in *Arthropeas siberica*."

In 1886 Dr. Williston erected the genus *Arthroceras* (Ent. Americana, II, 107), based chiefly on the character above mentioned with *A. pollinosum* (a new species), and *A. leptis* O. S. as the types. That *A. leptis* belonged to the genus *Arthroceras* was recognized by Coquillett in determining the species for Mrs. Slosson's list of Mt. Washington insects (Ent. News. VI, 6, 1895).

The two species may be separated by the following table:

Thorax unicolor, yellowish pollinose; halteres yellow. Colorado, Washington..... *pollinosum* Will.

Thorax blackish, with two yellowish pollinose stripes; halteres brown. White Mts., N. H..... *leptis* O. S.

Both species seem to be confined to the Canadian zone. The former I have received from Clear Creek, Col., May 20, 1891 (Oslar); Happy Hollow and Little Beaver, Col., July 14 and 19 (Gillett). The latter has only been taken in New Hampshire, White Mts., "woods and alpine" (E. P. Austin); "Alpine region of Mt. Washington, at or above 5,500 ft." (Mrs. Slosson); "near summit," Mt. Washington, July 25, 1875 (Dr. Geo. Dimmock); Mt. Washington, July 7, 1909 (F. A. Sherriff); Base Station, Mt. Washington, July 30, 1912 (F. W. Dodge).

The species of the genus *Arthropeas* are likewise comparatively rare, and also seem to be confined to the Canadian zone. The species may be tabulated as follows:

Anal cell closed; wings distinctly banded; length, 8-9 mm..... *americana* Loew.

Anal cell narrowly open; wings not banded; length, 12-14 mm..... *magna*, n. sp.

*Arthropeas americana* Loew.

The following brief description is given chiefly as a comparative one to Say's *Xylophagus fasciatus:*

Thorax black, covered with a yellowish pollen, leaving three wide black vittæ; scutellum and metanotum black; abdomen yellow, basal half of the first to fourth segments black, the remaining segments yellow; halteres entirely yellow; legs yellow, outer half of the tarsi brown; apical third of the wing smoky black, base of the submarginal and first posterior, tip of the first basal, the entire discal and fourth posterior and outer portion of the fifth posterior cells whitish and forming a wide band across the centre of the wing; the greater portion of the first and second basal cells, base of the fifth posterior and tip of the anal cell and the anal angle smoky black; base of the wing and greater portion of the anal cell whitish. Length, 8.5 mm.

The following records constitute our present knowledge of its distribution: N. Wisconsin (Loew); Mass. (O. Sacken); Cheshire Harbor, near Mt. Graylock, Mass., June 30 (I. W. Beecroft); Lake Ganoga, North Mt., Pa., 2,300 ft., Aug. 29, 1897 (C. W. Johnson).

*Xylophagus fasciatus* Say.

"Wing dusky, fasciated; abdomen fasciated. Inhabits Indiana.

"Body dusky; thorax, *posterior portion honey-yellow; poisers blackish at tip;* wings dusky, a more distinct band on the middle and at the tip; feet honey-yellow; *hind tibiæ blackish;* tergum yellow, basal half of the four basal segments black; *remaining segments nearly all black.* Length over two-fifths of an inch.

"By an accident the head and anterior part of the thorax of this fine specimen were destroyed, but the above description will sufficiently indicate the species. The wing nervures resemble those of the *maculatus* Fabr."

In the above description by Say, based on an imperfect specimen, I have italicized the parts showing discrepancies to Loew's species. The differences are too great to consider them the same; the description of the bands on the wings, "on the middle and at the tip," also does not agree with Say's usual accuracy. The locality, "Indiana," which is entirely in the upper Austral, would also indicate a different species. Say's reference to *maculatus*, which is a *Xylomyia* (= *Solva* Walk.), would indicate a closed fourth posterior cell.

*Arthropeas magna*, n. sp.

*Arthropeas*, n. sp.? Townsend.—Trans. Amer. Ent. Soc., XXII, 61, 1895.

♂.—Face blackish, covered with a dull yellowish pollen and pile, beard whitish, face with a deep ∧-shaped groove bordering the oral cavity, from which extends a deep groove between the antennæ to the frontal triangle, ocelligerous tubercle black, palpi, proboscis and antennæ yellow. Thorax black, thinly covered with hair (blackish on the dorsum and yellowish on the sides), through which show four dull yellow pollinose stripes, the lateral stripes broad, the middle one narrow, but expanding at the ends and connected at the humeri and post-alar callosities with the lateral stripes, the black areas between the stripes shining behind the suture; pleuræ black, brownish pollinose; scutellum black. Abdomen black, middle and sides shining, first segment with a wide yellow, pollinose, posterior band, almost interrupted in the middle and expanding until it attains the full width of the segment at the lateral margins; second, third and fourth segments posteriorly margined with a yellow pollinose band, contracted in the middle and at the ends; on the second and third segments the bands are brown in the middle and at the ends, the remaining segments

yellowish pollinose; venter entirely yellow. Legs yellow, coxæ blackish, halteres yellow. Wings brownish, slightly darker in the middle and along the fifth longitudinal vein; veins and costal cells yellow, basal half of the marginal cell white, the greater portion of the first and second basal cells noticeably lighter than the rest of the wing. Length, 12 mm.

♀.—Face, front and occiput covered with a dense brown pollen, the front about one-fourth the total width of the head, with five grooves above the base of the antennæ, the four outer ones slightly diverging below, above fusing and deflecting towards the ocelli, the middle one obsoletely divided into three smaller ones below the ocelli. The thoracic stripes are more prominent and a brighter yellow than in the male; scutellum velvety-brown, with three transverse ridges. The abdomen is shining and brownish black, with the posterior pollinose bands on the first, second and third segments, broadly interrupted. Length, 14 mm.

Three specimens, Beulah, Manitoba, received from Mr. C. T. Brues. Holotype and allotype in the author's collection. Paratype in the Museum Comparative Zoology, Cambridge, Mass.; "Hill City, So. Dakota" (Townsend).

This interesting species has the thick heavy form of *Cœnomyia*, but the generic characters are those of *Arthropeas*, except that the anal cell is narrowly open. It seems to more clearly show the relationship of the two genera than the other species.

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## TWO NEW CANADIAN BEES.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

*Sphecodes hudsoni*, n. sp.

♀. Length about 7 mm.; head and thorax black, legs dark rufo-fuscous, abdomen entirely clear yellowish-ferruginous; head broader than long, face very broad, thinly covered (including the clypeus) with fine pale hair; mandibles bidentate, the apical half dark chestnut-red, the inner tooth short and rounded, about 208$\mu$ from apex of mandible; process of labrum very broad, shallowly depressed or subemarginate in middle; only the first three points of the flagellum remain in the types, but they are dull ferruginous beneath; clypeus strongly punctured; front extremely, densely and minutely punctured in middle, not quite so densely at sides, the punctures are so small as to be hard to see with a hand lens; mesothorax brilliantly shining, with scattered punctures, the median sulcus well marked; pleura, beneath the wings, with a large shining raised area, the pleura below this with fine close rugæ; area of metathorax large, fully 320$\mu$. long, with about 20 coarse rugæ, the lateral ones parallel, radiating, the middle ones

irregular, some branching, Y-like in form; regular dark rufous; wings dusky hyaline, distinctly reddish, stigma and nervures red-brown; second submarginal cell broad, receiving first recurrent nervure just beyond the beginning of its last third; legs thinly clothed with pale hair; abdomen almost entirely impunctate, quite broad; apical plate about 170$\mu$ broad.

*Hab.*—Hudson Bay. British Museum (44. 17). In Robertson's tables of *Sphecodes* this runs nearest to *S. minor*, which is a larger and evidently different species. In the table of Maine species it runs to the group of *S. dichrous*, to which it is not closely allied. In my table of allies of *dichrous* it runs to the very much larger *arroyanus*. Superficially it is much like *S. washingtoni* Ckll., but aside from other differences, the metathoracic area is much larger than in *washingtoni*. It is a much larger species than *S. cressoni*, and has a broader head. Among the species of the northwest, it falls nearest to *S. patruelis* Ckll. (formerly recorded in error as *minor*), but *patruelis* has the front more coarsely punctured, and area of metathorax with stronger, irregular (not radiating) rugæ. It is quite different from *S. sulcatulus* by the densely punctured front, etc. The specimen has been in the British Museum for 67 years.

I take this opportunity to record two other interesting specimens of *Sphecodes* belongiing to the British Museum.

(1.) *Sphecodes falcifer* Patton. Colorado (*Cockerell*). A common species of the Eastern United States, but new to Colorado. comes from my old collection of 1887-1890. The material which went to the British Museum was mostly in papers, and nearly all came from Wet Mountain Valley. A statement of the exact locality was furnished for each lot, either in a letter or on the box, but unfortunately the data were only preserved when they accompanied the specimen itself, and all the rest were simply labelled "Colorado (Cockerell)". It is nearly certain that all the specimens labelled in this way were from Wet Mountain Valley.

(2.) *Sphecodes persimilis* Lovell & Cockerell. Trenton Falls, New York; from F. Smith's collection. The specimen (♀) has the junction of the first and second dorsal abdominal segments rather evidently depressed, to this extent slightly approaching *S. pecosensis*. F. Smith, who owned the specimen, died in 1879, but the species was not described until 1907.

*Anthidium wallisi*, n. sp.

♀. Length about 10 mm.; black with chrome yellow markings, those on face, consisting only of an oval spot on each side touching upper part of clypeus, paler yellow; a large yellow spot above each eye; mandibles, tegulæ and thorax wholly without yellow; antennæ black; pubescence dull white, on vertex shining

and yellowish; ventral scope shining cream-colour; wings strongly brownish; femora and tibiæ black; front tibiæ with a yellow subapical more or less cuneiform mark; middle tibiæ with a yellow mark extending from before middle to apex; hind tibiæ with a yellow band, interrupted not far from base; tarsi ferruginous, more or less blackened at base, their hair mainly ferruginous; hind basitarsi with a broad yellow band; no pulvilli; first abdominal segment with a diamond-shaped yellow mark at each extreme side; second segment with a larger mark on each side, deeply notched inwardly, and a pair of transverse, discal stripes; third segment with an interrupted band, broad at sides, broadly and deeply notched in front sublaterally; fourth like third; fifth with the notch less developed, and the interruption narrower; sixth with two large yellow patches.

*Hab.*—Peachland, British Columbia, August 9, 1909 (*J. B. Wallis*, a 64.)

This has nearly the face-markings of *A. porteræ personulatum* Ckll., but *personulatum* is considerably larger, the spots at side of face are lower down, the abdominal markings are much paler, and the abdomen is not so densely punctured. I asked myself whether *A. wallisi* could possibly be a colour-variety of *A. tenuifloræ* Ckll., but it differs as follows, aside from the colour-markings: eyes paler and lighter green; teeth at lower corners of clypeus larger, nearly equal (the outer one much smaller in *tenuifloræ*); lateral tooth-like angles of sixth abdominal segment very prominent; broad depressed apical margins of abdominal segments excessively, minutely and densely punctured, not shining (shining and less densely punctured in *tenuifloræ*).

## PHENACOCCUS BETHELI AGAIN.

BY T. D. A. COCKERELL, BOULDER, COLORADO.

When recently describing *P. betheli* in THE CANADIAN ENTOMOLOGIST, I remarked that it was possibly a subspecies of *P. cockerelli* King. I was surprised, a few days ago, to receive from Mr. E. Bethel a quantity of *P. betheli* on branches of *Amelanchier*, collected by Mr. L. J. Hersey at Steamboat Springs, Colorado. This looked suspicious, as Steamboat Springs is the type locality of *P. cockerelli*. However, the new material is twice the size of *cockerelli*, and yet the legs are not merely relatively, but actually smaller, and the fourth antennal joint is very short as in the Grand Canon insect. The insects, on being boiled in caustic potash, stain it a deep wine red. The larva is light orange.

Although I transmitted the original *cockerelli* material to Mr. King, I did not study it. I have, however, studied abundant material, agreeing with King's description, found by Mr. L. C.

Bragg on wild plums at Boulder, Colorado. Without feeling altogether confident that *betheli* is a distinct species, it seems that it must be so regarded unless proof can be brought to the contrary.

A word may be added concerning the value of antennal measurements in the determination of Coccidæ. Those who have used the antennal formulæ have found them very unreliable, and I have long ago given them up. It does not follow, as some uncritically assume that antennal measurements are therefore useless. The best way is to measure the joints of several antennæ, and from the measurements plot a "curve." I do this by using semitransparent typewriter paper, through which I can see my lined standard sheet. The curves so made will, of course, vary, hardly any two antennæ being exactly alike; but except for abnormalities (pathological specimens), nearly every species gives quite different curves, while two species, very different in other respects, will give nearly the same curve. Some of the widely distributed species give curves almost too variable to be of much service, but in these cases it is possible that the material contains more than one thing. It is also probable that widely distributed forms, living on various plants, are strongly heterozygous, while native species, with uniform environment and more or less restricted distribution, are prevailingly homozygous. It would be worth while for someone to carefully investigate a number of species with this point in mind.

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The names of the members of the Society in the group on Plate I. are as follows:

*First row*, reading from right to left.—J. D. Evans, Prof. W. Lochhead, Rev. T. W. Fyles, H. H. Lyman, Dr. E. M. Walker, Dr. C. Gordon Hewitt, G. Beaulieu, A. F. Winn, Rev. L. Marcotte.

*Second row*, reading from left to right.—L. Cæser, Dr. E. H. Blackader, Rev. J. B. Mignault, Rev. Brother Germain, H. F. Hudson, Arthur Gibson, J. M. Swaine, G. E. Sanders, Dr. R. Matheson.

*Top row*, reading from right to left.—A. G. Turney, J. D. Tothill, Prof. J. E. Howitt, A. W. Baker, J. A. Guignard, J. I. Beaulne.

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## CORRECTIONS.

Page 214, line 7, for *heyoniæ* read *bryoniæ*.

Page 214, line 15, for pormiaries read primaries.

Page 215, line 24, for *Keolexia* read *Neolexia*, and for *scylina* read *xylina*.

# AN EARLY REFERENCE TO THE OCCURRENCE OF THE ARMY WORM IN PENNSYLVANIA, NEW YORK AND CANADA.

BY F. M. WEBSTER, WASHINGTON, D. C.

The year 1743 seems to have been the first of which we have what is generally accepted as undoubtable evidence of the occurrence of this pest in the United States in destructive numbers. This information has always been based solely upon a statement made by Chas. L. Flint in a report on the Climatology of New England,* and is as follows: In 1743 there were "millions of devouring worms in armies, threatening to cut off every green thing. Hay very scarce, £7 and £8 a load."

There, however, is another bit of evidence of this outbreak of the Army worm in the year 1743 that appears to have been entirely overlooked. This is contained in a small but somewhat rare volume, by John Bartram, printed in London, England, in 1751.†

Mr. Bartram, as he states, "set out from his house on Skuylkil River the 3rd day of July, 1743." Under date of July 16th, near the Indian town of Tohicon, situated between the east branch of the Susquehanna and the main river, he says: "Here I observed for the first time in this journey that the worms which had done much mischief in the several parts of our Province by destroying the grass and even corn for two summers, had done the same thing here, and had eaten off the blades of their maize and long white grass, so that the stems of both stood naked four-foot high; I saw some of the naked dark-coloured grubs half an inch long, the most of them were gone, yet I could perceive they were the same that had visited us two months before; they clear all the grass in their way in any meadow they get into, and seem to be periodical as the locusts and caterpillar, the latter of which I am afraid will do us a great deal of mischief next summer."

Under date of 28th of the same month, having reached Oswego, New York, Mr. Bartram makes this entry in his record: "This was a rainy, thundering warm day, and two deputies arrived from the Oneidas. News came that the worms had destroyed abundance of corn and grass in Canada."

*Second Annual Report of the Secretary of the Massachusetts Board of Agriculture, 1854 (printed in 1855), p. 36.

† Observations on the Inhabitants, Climate, Soil, Rivers, Productions, Animals, and other matters worthy of notice. Made by Mr. John Bartram in his travels from Pennsylvania to Onondago, Oswego and the Lake Ontario, in Canada, to which is annexed a curious account of the Cataracts at Niagara. By Mr. Peter Kalm, a Swedish gentleman who travelled there. London: Printed for J. Whiston and B. White, in Fleet Street, 1751.

## ENTOMOLOGICAL SOCIETY OF ONTARIO.—ANNUAL MEETING.

The Forty-ninth Annual Meeting of the Entomological Society of Ontario was held on Tuesday and Wednesday, Nov., 19th. and 20th. During the day meetings, which were held at the Carnegie Library, the chair was occupied by the president, Dr. E. M. Walker, while the evening meeting, held at the Normal School, was opened by the Hon. Martin Burrell, Minister of Agriculture.

Among those present were the Rev. T. W. Fyles, Dr. C. G. Hewitt, Messrs. J. H. Grisdale, W. H. Harrington, A. Gibson, J. M. Swaine, F. W. L. Sladen, J. A. Guignard, J. I. Beaulne and Rev. Bro. Germain, Ottawa; Messrs. H. H. Lyman and A. F. Winn, Montreal; Prof. W. Lochhead, Macdonald College, Que.; Mr. J. D. Evans, Trenton; Prof. J. E. Howitt, Messrs. L. Cæsar and A. W. Baker, Guelph; Dr. R. Matheson, Truro, N. S.; Mr. A. G. Turney, Fredericton, N. B.; Rev. Father Marcotte, Sherbrooke, Que.; Rev. J. B. Mignault, St. Therese, Que., and Messrs. J. B. Tothill, G. Beaulieu, G. E. Sanders, W. A. Ross, H. F. Hudson, C. E. Petch, Field Officers of the Division of Entomology.

On Tuesday morning the members met at the Experimental Farm, where a pleasant hour was spent looking over the specimens exhibited by those present and in examining the fine collections belonging to the Division. A meeting of the Council took place at eleven o'clock at which the report of the proceedings of the Society during the past year was drawn up and various questions of interest to the Society were discussed. A committee was appointed to consider certain changes in the constitution of the Society, which were proposed at a recent meeting at Guelph. In view of the fact that next year will mark the event of the Society's fiftieth annual meeting, it was decided that a Jubilee meeting be held in honour of the occasion, to which delegates from other Societies be invited and that this meeting be held at Guelph, about the beginning of September, the exact date to be decided upon later. A special committee was appointed to take charge of the arrangements in connection with the meeting.

In the afternoon the Society met at the Carnegie Library, the proceedings commencing with the reading of the reports of the various officers of the society, including those of three of the directors on the insects of the year in their respective districts, viz., Messrs A. Gibson, Ottawa; A. Cosens, Toronto; and W. A. Ross, Jordan Harbour. These were followed by the reports of the Montreal, Toronto and British Columbia branches.

The Annual Address was then delivered by the president, Dr. Walker, the subject being "Faunal Zones of Canada."

Dr. Hewitt then gave an interesting "Review of Canadian Entomology for 1912" in which he outlined the work of the division for the year, illustrating the valuable results that have already followed the establishment of field stations in various parts of the country. Prof. Lochhead next addressed the meeting on "The Teaching of Entomology in the Agricultural Colleges", a subject which evoked much interesting discussion. A particularly enjoyable feature of the meeting was the next paper, "The Rise in Public Estimation of the Science of Entomology", by the Rev. Dr. Fyles, whose charming style and dramatic delivery were once again the delight of all the members present.

At the evening meeting, which was held in the Auditorium of the Normal School, the chair was occupied by the Hon. Martin Burrell, Minister af Argiculture, who in a highly entertaining address, introduced the lecturer, Mr. F. W. L. Sladen, of the Division of Entomology. Mr. Sladen, who is a leading authority on apiculture, gave a very interesting and instructive lecture on "Bumble-bees and their Ways," which was illustrated by a number of beautiful lantern slides.

A special feature of the Wednesday meeting was an entertaining address by Mr. J. H. Grisdale, Director of the Dominion Experimental Farms, in which a keen appreciation was shown of the work that is now being done in Canada in economic entomology.

During the meeting the following papers were read; "The Chinch Bug in Ontario," by Mr. H. F. Hudson; "The Importation and Establishment of Predaceous Enemies of the Brown-tail Moth in New Brunswick," by Mr. J. D. Tothill; "The Discovery of the San José Scale in Nova Scotia," by Mr. G. E. Sanders; "Observations on the Effect of Climatic Conditions on the Brown-tail Moth in Canada," by Messrs Tothill and Sanders; "Observations on the Apple Maggot in Ontario in 1912," by Mr. W. A. Ross; "Notes on Injurious Orchard Insects in Quebec in 1912," by Mr. C. E. Petch; "Insects of the Season in Ontario," by Mr. L. Cæsar; "Injurious Insects in Quebec for the year 1912," by Prof. W. Lochhead; "Forest Insects in Canada in 1912," by Mr. J. M. Swaine; "The Elater Beetles," by Mr. G. Beaulieu; "Aquatic Insects," by Dr. R. Matheson; "The Entomological Record for 1912," and "Flea Beetles and their Control," by Mr. A. Gibson; "Insect Pests of Southern Manitoba during 1912," by Mr. Norman Criddle; "Some New and Unrecorded Ontario Fruit Pests" and "Arsenite of Zinc as a Substitute for Arsenate of Lead," by Mr. L. Cæsar.

The election of officers for the ensuing year resulted as follows:

*President:*—Rev. C. J. S. Bethune, M. A., D. C. L., F. R. S. C., Professor of Entomology and Zoology, O. A. College, Guelph.

*Vice-president:*—Dr. C. Gordon Hewitt, Dominion Entomologist, Central Experimental Farm, Ottawa.

*Secretary-Treasurer:*—Mr. A. W. Baker, B. S. A., Demonstrator in Entomology, O. A. College, Guelph.

*Curator:*—Mr G. J. Spencer, Assistant in Entomology, O. A. College.

*Librarian:*—Rev. C. J. S. Bethune.

*Directors:*—Division No. 1, Mr. Arthur Gibson, Div. of Entomology, Central Experimental Farm, Ottawa; Division No. 2, Mr. C. E. Grant, Orillia; Division No. 3, Mr. A. Cosens, Parkdale Collegiate Institute, Toronto; Division No. 4, Mr. C. W. Nash, East Toronto; Division No. 5, Mr. F. J. A. Morris, Port Hope; Division No. 6, Mr. R. S. Hamilton, Collegiate Institute, Galt; Division No. 7, Mr. W. A. Ross, Jordan Harbour.

*Delegate to Royal Society:*—Mr. A. F. Winn, Montreal.

*Auditors:*—Messrs J. E. Howitt and L. Caesar, O. A. College.

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## DESCRIPTION OF TWO NEW SPECIES OF ORTHOPTERA FROM PERU.

BY A. N. CAUDELL.

Bureau of Entomology, U .S. Dept. Agriculture, Washington, D. C.

Among Orthoptera recently received from C. H. T. Townsend, Piura, Peru, for determination were the following two species which seem to be undescribed.

*Plectoptera huascaray*, n. sp.

Description.—♂ (the ♀ unknown): Most closely allied to the *P. micans* of Bolivar from the West Indies but is decidedly larger. Is also allied to *P. picta* S. and Z. but has darker elytra and wings and the pronotal disk is not margined in front.

General colour black variegated with brown. Head black with a small ashy variegation and transverse stripe about the insertion of the antennæ; antennæ black, the first few segments lighter. Pronotal disk broadly elliptical, black in colour with the lateral margins broadly and the posterior margin very narrowly and interruptedly bordered with yellow. Elytra brown and black, the humeral area and a large subquadrate spot at about the apical third of the posterior margin black, the rest yellowish brown flecked with black, the black flecks assuming a definite elongate shape and regular arrangement along the posterior half of the costal margin. Wings large, smoky brown, the apical area nearly black, the costal margin almost entirely so; the apical area is very large, being nearly as long as the rest of the wing, and the base is straight, not at all angulate. Abdomen black; supra-anal plate twice as broad as long, mesially produced apically and narrowly

rounded; subgenital plate asymmetrical, diagonally incised apically and furnished with short style-like organs; cerci short and stout, widest beyond the middle. The legs are black with a pre-apical yellowish band on the tibiæ and the base of the basal segment of the tarsi also lighter.

Measurements. Total length from front of pronotum to the tip of the elytra, 7 mm.; of elytra 5.5 mm.; of wing, 10 mm.

Type a single ♂, Huascaray, Peru, September 21, 1911, altitude 6500 feet. C. H. T. Townsend collector. Catalogue No 15321 U. S. Nat. Museum.

*Cocconotus charape*, n. sp.

Description.—♂ (the ♀ unknown): Allied to *C. pulcher* Brunn. and runs to that species in the tables in Brunner's Monograph of the Pseudophilinæ. It differs, however, very distinctly from that species.

In size and general coloration agreeing fairly well with *pulcher*. Head black and yellowish, the occiput blackish shading into yellowish on the cheeks and continuing yellowish down to the mouthparts; mandibles, labrum and base of the clypeus and the sides of the face piceous, front of the face dark reddish brown with an apically pitted tubercle in the centre; on each side and just above the ends of the clypeal suture the face bears a large erect piceous pointed tubercle about as long as the clypeus; antennæ piceous basally, shading gradually to reddish brown. Pronotum without carinæ, the shoulders only slightly squared; disk slightly rugose, truncate behind, gently rounded before, the main transverse sulcus profound and situated distinctly behind the middle; prosternal spines long, sharp and piceous, the rest of the lower surface of the thorax light yellowish; the disk and the lateral lobes of the pronotum margined with piceous and the central portion of the disk, especially anterior of the principal sulcus, light yellowish brown, which colour continues down diagonally forwards entirely across the lateral lobes. Legs stout and yellowish, the coxæ, the geniculations and the dorsal surface of the anterior tibiæ more or less infuscated; fore tibiæ furnished with conchate foramina and armed above on the inner margin with four tubercular swellings and armed beneath with a double row of spines; fore femora less than one and one half times as long as the pronotum, smooth above but armed beneath on the front margin with three short black spines; middle legs similar to the front ones but the tibiæ have three distinct spinules above; hind femora very stout and short, the greatest width about three and one half times the length, smooth above, beneath armed on the outer side with seven or eight stout spines and on the inner margin with a smaller number of smaller spines, all the spines piceous to the base; hind tibiæ

slightly curved, armed above and beneath on both margins with piceous spines, those beneath smaller and placed more remote from each other. Elytra fully developed, surpassing the tip of the abdomen, the anterior half greenish, the posterior half brownish; tympanum small, that of the left elytron the smaller and margined with piceous; wings about as broad as long and very gently infumate, when folded just reaching the tip of the elytra. Abdomen moderately plump, dark brownish, apically growing lighter; supra-anal plate small, vertical apically, obtusangularly rounded, entire; subgenital plate moderately elongate, truncate apically and furnished with a pair of elongate club-shaped apical styles, black in colour; cerci short, stout and apically cut squarely off, the tip slightly excavate and armed dorsally with a subapical tubercle.

Measurements. Entire length of body from the front of the head to the tips of the subgenital stylets, 33 mm.; pronotum, 7 mm.; elytra, 26 mm.; wings, 23 mm.; fore femora, 10 mm.; hind femora, 20 mm.; width of hind femora at the widest part, 6 mm.; of elytra at widest point, 7 mm.; three millimeters from the tip, 3 mm.; of wings at widest point, 21 mm.

Type a single ♂. Rio Charape, Peru, September 17, 1911. C. H. T. Townsend, collector. Catalogue No. 15320 U. S. Nat. Museum.

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## ON SOME APPARENTLY NEW COLEOPTERA FROM INDIANA AND FLORIDA.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

On of the most common of the Chrysomelid beetles taken in Florida in February and March was *Lema brunnicollis Lac.*, which was abundant on the flowers and foliage of the thistle *Carduus horridulus* Push. The first blossom of this thistle opened near Sarasota on February 6th, and the first *Lema* was taken on the 8th. They were found mating on February 16th. and again at Sanford on March 28th.

A careful comparison of these Florida specimens with those from Indiana discribed under the name *brunnicollis* Lac. in my "Coleoptera of Indiana", p. 1111, shows that the two are very distinct, the Florida example being much larger, with less convex elytra and having the frontal tubercles less prominent, the thorax less constricted at base, with two rows of coarse punctures along the median line and with numerous similar punctures scattered over the apical half. In colour the Florida specimens are darker, the elytra being blackish blue and the thorax in most specimens having the apical half clouded with greenish fuscous. These differences were pointed out to the late Frederick Blanchard,

of Tyngsboro, Maassachusetts, and to Frederic Knab, of Washington, D. C., both of whom agreed with me that the southern species was undoubtedly the one described as *brunnicollis* by Lacordaire, although Mr. Blanchard wrote that examples of the form discribed from Indiana had been in his collection for many years under that name. The northern form is apparently unnamed and is herewith described more in detail as follows:

*Lema palustris* sp. nov.

Elongate-oblong. Head, thorax, scutellum and under surface, except abdomen, dull red; antennæ, legs and abdomen black; elytra bright greenish blue. Head very finely and sparsely punctate, the front with a strong bilobed tubercle. Antennæ with joints 1 to 4 subequal, the others longer and gradually stouter. Thorax as long as wide, finely and very sparsely punctate, with a single row of 5 or 6 coarser punctures along the median line; sides constricted behind the middle. Elytra impressed on the inner side of humeral angles, each with 10 rows of rather coarse, scarcely impressed punctures; intervals wholly smooth; abdomen distinctly but rather sparsely punctate. Length 4-4.5 mm.

In Indiana the species here discribed has been taken by sweeping herbage only in the tamarack swamps of the northern third of the State, hence the specific name given. It is probably a member of the Alleghanian fauna. The principal differences between it and the southern form, believed to be the true *brunnicollis*, have been given above. The length of the latter is 5-5.5 mm., and the body is proportionally much stouter. From the description of *L. coloradensis* Linell, *palustris* differs in having the antennæ and legs wholly black and in the abdomen being distinctly punctate.

*Chlamys nodulosa*, sp. nov.

Subquadrate, robust. Uniform dark brownish bronze. Antennæ paler at base, serrate from the fifth joint, the third and fourth joints subequal. Eyes large, reniform, deeply emarginate on the inner side, separated by an interval less than their longer diameter. Front with a number of fine scattered punctures. Thorax without trace of strigæ, the central gibbosity large, its crest with a pair of tubercles, its anterior face with four interrupted carinæ, each pair confluent at apex; a prominent tubercle each side one-third from apex and near the outer of these carinæ, and another, semi-obsolete, midway between this and the side of thorax, the intervals between the carinæ and tubercles deeply, coarsely but not densely punctate. Elytra each with about 9 prominent tubercles, the intervals between these with coarse punctures. Pygidium coarsely and sparsely punctate and with three short carinæ extending from a median gibbosity nearly to the posterior border. Under

surface, especially the meso- and meta-episterna, very coarsely, densely and shallowly punctate. Length 4-4.5 mm.

Described from 10 specimens beaten from scrub-oak near Arch Creek, Sanford and Ormond, Florida. March 12th.–April 3rd. A pair of the cotypes are in the collection of Fredric Knab, and another in that of the late Mr. Blanchard.

This is a smaller species than *C. plicata*. very different in the sculpture of thorax and elytra and in the narrower separation of the eyes. It is more subquadrate and robust than *Exema gibber* Oliv. and has also a wholly different sculpture from that species, the tubercle being more pointed and prominent and the punctures more rounded, distinct and deeper. The character usually given as separating the genera *Chlamys* and *Exema* is very slight and more or less variable, and it is my opinion that the latter genus should be abandoned, *Chlamys* having the priority.

*Cryptocephalus sanfordi*, sp. nov.

Short, robust, subcylindrical. Head, thorax, scutellum, legs and under surface reddish yellow; elytra straw-yellow, the basal fourth of second interval, the entire fourth interval except a small oval spot at apical fourth, and three oblong spots on sixth interval shining black; joints 6–11 of antennæ fuscous. Front of head with a few minute scattered punctures. Thorax wholly without punctures. Elytra with six entire punctured dorsal striæ, the sutural stria represented by only 3 to 4 punctures, the first dorsal forking at the middle and therefore double on basal half, the fourth and fifth striæ sinuous and approaching in the black spaces; alternate intervals wider and wholly pale. Abdomen minutely and sparsely punctate, each puncture bearing a fine prostrate hair; fifth ventral deeply concave at middle. Length 3.5–4mm.

Described from 2 specimens beaten from willow near Sanford, Florida, March 25th.—27th., 1901.

*Brachys cuprascens*, sp. nov.

Ovate, shorter and stouter than *B. ovata* Web. Dark bronze, thickly clothed above with short coppery-red and whitish hairs, those on elytra arranged in three irregular very sinuous cross-bands composed mainly of the reddish hairs, but bordered anteriorly with the whitish ones. Head and thorax as in *B. ovata*, the median groove of the former narrower and less prominent. Rows of elytral punctures much coarser and more distinct, and regular than in *ovata*, those of the interval next to the marginal carina so arranged as to give the appearance of ribs or plicæ beneath the vestiture. Shallow punctures of the under surface much less evident than in *ovata*. Last ventral of female more deeply emarginate, or impressed, and with the fimbriate hairs

much more dense than in *ovata:* last ventral of male small, its hind border in both sexes finely pectinate. Length 4.5–5.2 mm.

Nine specimes beaten from the flowers of the farkle-berry, *Vaccinium arboreum* Marsh, near Sanford and Ormond, March 29th.—April 6th. Easily told at a glance from *ovata* by the much more dense and coppery vestiture. Mr. Blanchard wrote me that he had had it separated but not named in his collection for more than 40 years.

*Hallomenus fuscosuturalis*, sp. nov.

Elongate-oblong. Dull brownish yellow, sparsely clothed with fine prostrate yellowish hairs; elytra with a common sutural fuscopiceous stripe which is widest in the region of the scutellum, the margins also often darker than the disk. Head finely and evenly punctate; eyes small, deeply emarginate on the inner side; antennæ with second joint one-half the length of third, joints 3–11 subequal and one-half longer than wide instead of subquadrate as in the other species of the genus except *serricornis*. Thorax at base one-half wider than long, sides gradually rounded to apex which is one-third narrower than base; disk finely and densely punctate, the basal impressions feeble. Elytra as wide at base as thorax, sides parallel for three-fifths their length, thence gradually converging to the rounded apex; their surface, as well as that of abdomen, very finely and much less closely punctate than thorax. Length 3 mm.

Six specimens beaten from scrub-oak and willow near Sanford. March 28—29, 1911.

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Newfoundland Lepidoptera.—In a little box of insects collected at St. Anthony's during the summer of 1910, were specimens of *Argynnis freija* Thunb.; *A. myrina* Cran.; *Colias pelidne* Bdv.; *Coenonympha inornata* Edw.; *Apantesis virguncula* Kirby; *Aplectoides livalis* Smith; *Anarta cocklei* Dyar; *Mamestra sutrina* Grote; *Autographa alias* Oltol.; *Epirrita dilutata* D. & S.; *Epelis truncataria* Walk.; *Pyrausta insequalis* Guen.; *Crambus unistriatellus* Pack. A. F. Winn, Westmount.

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*Lycaena comyntas* Godt.—While collecting Geometridæ after sundown at Valcour, N. Y., July 25th., I found a male *L. comyntas* asleep on a blade of grass. Like many other "Blues," it rests for the night head downwards, the tails of the hind-wings and the black spot strongly resembling a pair of antennæ and an eye at the wrong end. A second specimen was found in the same attitude after a few minutes' search. A. F. Winn, Westmount.

## GEOMETRID NOTES—DESCRIPTION OF A NEW EOIS.

BY L. M. SWETT. BOSTON, MASS.

*Eois brauneata*, n. sp.

Expanse 13 mm; palpi quite long, blackish; head light ash gray at base of antennæ, darker beyond. Thorax and abdomen light ash gray. Fore wings long lanceolate, light gray shaded with brown. Five black dots on costa, from the first basally runs a black hair-line irregularly across the wing showing strongly on the veins as dots. Above the black discal dot there is a spot on the costa; from the discal dot to inner margin there runs a black line. There is a narrow pointed brown band which runs just outside of discal dot and extends toward tip of forewing as it runs beyond discal spot. Beyond this narrow band which resembles slightly the band of *Leptomeris occidentaria* Pack., only much narrower, there is a wide light ash space. Outer margin with a broad brown band crossing to inner margin, through the middle of which runs a zig-zag white line. Venular dots at base of long brown fringe. Hind wings grayish brown with an irregular, broad fuscous band crossing as two zig-zag lines on each side of the discal spot. This band appears to be projected outwardly on the veins. There is a marginal irregular black line. The fringe is long and brownish gray in colour. Beneath fore wings reddish brown, especially near apex of wing. There is a trace of the fuscous band crossing wing at discal spot, which is apparently in the middle of it. The costa has dots of black and yellow at intervals from base to tip. Hind wings lighter coloured than fore wings. Fuscous band at discal spot showing through faintly and bent toward opposite spot; rest of wing beyond light ash.

This delicate little Geometer may be known by the peculiar band across the fore and hind wings and by the ash colour shaded with brown. I take pleasure in naming this species after Miss Braun.

Type.—1 ♀, May 20, 1906, Cincinnati, Ohio; from Miss A. F. Braun; in my collection.

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## GEOMETRID NOTES.—A NEW DIASTICTIS HÜB.

BY L. W. SWETT, BOSTON, MASS.

*Diastictis anataria*, n. sp.

Expanse, 24 to 30 mm; palpi, 1 mm, grayish; head light gray at base of antennæ; thorax and abdomen light ashen gray. Fore wings light ash with a bluish tinge; there are four distinct costal patches of rusty brown, the outer being the largest. From each of the costal patches pale rust-coloured bands run sinuately to inner margin and at the outer margin is a broad reddish brown

patch extending almost to inner margin. The first costal patch is linear and points towards first venular dots of outer margin; a pale rust-red line runs from this patch almost to inner margin. The second costal patch is not as strongly angulated on costa as the first. A line runs from it to vein 3 in a straight line just inside the black linear discal dot, and then curves backward towards body to inner margin. The third costal patch is smaller than the others but has a pale line running from it to inner margin, bending outwards in a curve opposite discal line to the middle of vein 2, then going straight to inner margin. The fourth costal patch is very large, 1½ mm wide and 2 mm long; it seems to have a notch near the bottom on the outer side and from the base of this runs a pale rust-red line to inner margin straighter than the other lines. The apex of the fore wing is light bluish ash, and near the base of the fourth costal spot is the broad reddish-brown band, widening as it approaches inner margin, being more distinct in some specimens than others, as are also the costal lines, which hardly show in one specimen. The fore wings are finely powdered with red-brown strigæ and have black venular dots on outer margin. The hind wings have traces of two pale brown lines beyond discal spot, but this may be an arrangement of strigæ as it shows in only one specimen. The general colour is lighter ashen with a yellowish tinge and the venular dots are the same as on fore wings. Beneath the wings are densely strigate, the lines of fore wings showing through very faintly from the second and third costal patches on each side of discal spot. Beneath third and fourth patches of fore wings the costa is bright orange, and the apex has brown cloudings. The hind wings are densely strigated also and there are two pale red brown lines crossing wing beyond discal spot. The veins are ochreous and the dots are between, at base of fringe.

Type,—1 ♂, August 8, 1909. Half Way House, Mt. Washington, N. H; taken at light by myself.

Cotypes—2 ♂'s, July 27, August 11, 1909, N. E. Harbor, Maine; taken by Dr. Charles S. Minot, in Boston Society of Natural History collection. This species resembles *M. praeatomata* very slightly.

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We owe our readers an explanation of the extremely late appearance of our December number. Part of the proofs went astray in the mails and the discovery was not made until after a considerable loss of time. This is the more regrettable as it has resulted in the delay of the January number also.

## BOOK NOTICES.

The Large Larch Sawfly; with an account of its parasites, other natural enemies and means of control. By C. Gordon Hewitt. D. Sc. (Bulletin No. 10.—Second Series, Entomological Bulletin No. 5. Division of Entomology, Dept. Agriculture, Ottawa.)

It was a fortunate circumstance that when Dr. Hewitt came to Canada three years ago, he was already intimately acquainted with our most injurious Canadian forest insect, the Larch Sawfly (*Nematus erichsonii* Hartig), this species being apparently a native of Europe and more or less destructive there also. Dr. Hewitt had already spent three years in the investigation of the life history and economics of this insect in England and having thereby determined the means by which its ravages can be checked in its native country he was particularly well fitted to grapple with the more difficult problem of its control in the vast larch or tamarack districts of North America.

Since coming to Canada Dr. Hewitt's studies of the Larch Sawfly have been continued and the results of these and the earlier investigations are embodied in the present report, in which a detailed account is given of the life-history, parasites and other natural enemies of this insect in both Europe and North America and the means by which it can be controlled.

The artificial means of control which have proved useful in the English larch plantations are, of course, impracticable in the vast forests of Canada and we must therefore rely altogether upon the parasites and other enemies. These are, however, not potent enough in North America to check the extensive outbreaks of the sawfly, which have several times occurred in this country, until most of the trees of the affected region have been killed by repeated defoliation. Dr. Hewitt has accordingly been engaged in the importation of sawfly cocoons from England, where this species is largely controlled by an ichneumon fly, *Mesoleius tenthredinis* Morley, and has succeeded in rearing from the cocoons a considerable number of these useful parasites and liberating them in various parts of Canada where the Larch Sawfly is prevalent. There is thus much reason to hope that the *Mesoleius* will become established here and in time increase in numbers to such an extent as to materially aid the other natural enemies of the saw-fly, and perhaps entirely prevent the occurrence of such serious outbreaks as that which we have been experiencing in Canada of late years.

Among the noteworthy facts which have been brought to light in this study are the following: There are four or five ecdyses during the larval feeding period and another ecdysis within the cocoon, whereas according to Packard, whose statements have been followed in all subsequent accounts, there are only there moults. The period from the time of hatching to the spinning of the cocoon is about 16 to 21 days in Canada, which is about twice as long as given by Packard.

The habits of the Field Vole (*Microtis agrestis*), in England of extracting the larvae from the cocoons and feeding on them is parallelled in North America, as observed by Dr. A. N. Fisher of the United States Biological Survey, by the Deer-mouse (*Peromyscus maniculatus artemisiae*). Both of these rodents are normally phytophagous. Insectivorous birds are also an important aid in the control of the Larch Sawfly and their protection and encouragement is strongly recommended.

The bulletin is illustrated by an excellent coloured plate showing the adult and larva of *N. erichsonii*, the effect of its oviposition in the terminal shoot of the larch, and two of its most important parasites, the ichneumon fly, *M. tenthredinis*, and the fungus, *Isospora farinosa*, which attacks the larva within the cocoon. There are also a number of excellent drawings and half-tones from photographs.

Copies of this bulletin may be obtained from the Division of Entomology, Central Experimental Farm, Ottawa.

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A Preliminary List of the Insects of the Province of Quebec. Part I, Lepidoptera, by A. F. Winn.

This is a most important contribution to our knowledge of the distribution of Canadian insects. The list embraces nearly 1,300 species and is modelled upon the last edition (1909) of Smith's Insects of New Jersey. It is published as an appendix to the Annual Report of the Quebec Society for the Protection of Plants.

Brief diagnoses of each family are given and under each species is a full list of localities, dates of capture and names of collectors. There are also annotated lists of the collectors whose records have been included and of the localities referred to. A few of the commoner species are illustrated.

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# FURTHER NOTES ON ALBERTA LEPIDOPTERA, WITH DESCRIPTION OF A NEW SPECIES.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from Vol. XLIV., page 39.)

299. *Mamestra mutata*, sp. nov.—Closely allied to *trifolii* Rott., by comparison with which it is best described. Ground colour paler than in *trifolii*, with less irroration; orbicular elongate, oblique, sometimes produced to a point anteriorly, outlined in blackish, with pale annulus and dark centre. In *trifolii* it is round or nearly so, with the pale annulus less contrasting. Reniform much narrower in upper half than lower, the upper extremity the shape of an inverted V with the apex curved slightly outwards. A pale annulus is traceable round the reniform, but is conspicuous only as the strokes, particularly the outer stroke, of this V. In *trifolii* the reniform is kidney-shaped, symmetrical, and the annulus less contrasting superiorly. The subterminal line is paler and more contrasting than in *trifolii*, and the W is rather deeper, and usually preceded by black dentate marks. Fringes more contrastingly cut with pale than in *trifolii*. On the underside, on both primaries and secondaries, there is a smoky discal dot at the end of the cell in both species. In *trifolii* these dots are centred by a fine whitish line on the cross-vein. In *mutata* this line is absent. Size of *trifolii*, but apices rather more acute.

Described from 6 ♂s and 10 ♀s. Calgary, Alta. (4 pair, by the author, June 22nd–Aug. 9th); Miniota, Cartwright, Winnipeg, Man. (1♂, 3 ♀ s, Dennis, Heath, and Hanham, Aug. 3rd–Sept. 20th); Stockton and Provo, Utah, (2 ♀s, Spalding, Aug 5th and 27th); and Prescott, Ariz. (1 pair, Kunze, Sept. 8th and 10th).

Type, ♂, Calgary, in collection of the author.

This is the *albifusa* of Smith (Ent. News, XXI, 360, Oct. 1910,) in part, but is not the *albifusa* of Walker. The character of the orbicular and reniform, and of the discal spots beneath will best serve to distinguish *mutata* from *trifolii* and its var. *albifusa*, to

which latter my description might otherwise almost apply. I have held the species under the manuscript name for some time, thinking that I might ultimately find it to be a mere variation, which I am now satisfied that it is not. It is the *trifolii* of my former list which I cited as common some seasons, but I do not seem to have met with the species here for a good many years, my latest specimen being dated 1898. I have no Calgary *trifolii* in my collection at all, and if any one has a species from here under that name it will probably prove to be *mutata*. I have, however, *trifolii* from all the other localities mentioned for the new species except Miniota, and have 54 North American specimens now under examination, including one from Montreal, which I have compared with Walker's type of *albifusa* from Nova Scotia, in the British Museum. I have forms similar to *albifusa* from Ontario and several points in Manitoba, the latter showing a gradation from typical *trifolii*. Mr. J. B. Wallis of Winnipeg kindly lent me a splendid series to select from. One from Treesbank, which I returned him, appeared to be *mutata*, but none of the others. I have seen a specimen taken at Peachland, B. C. by Mr. Wallis. In Smith's paper above referred to, in designating this form as *albifusa*, he mentioned that I had labelled a Maine specimen for him as typical *albifusa*, but adds that he considered that specimen the only doubtful one of the series. I remain under the impression that my labelled specimen was correct. From his description, the bulk of his series were obviously *mutata*. *Albifusa* is a pale, strongly marked form of *trifolii* with contrasting shades and often sienna brown tints.

I have ten British examples of *trifolii* and have examined a long European series in the British Museum. They do not differ essentially from our North American forms, nor have I noticed any specimens, or any figured by Barrett or South, as referred to by Tutt, suggesting my new species. I am aware that there remain two names standing in our lists as synonyms of *trifolii* that remain to be identified, viz., *glaucovaria* Walker, and *major* Speyer. The type of the former, if still in existence, should be in the collection of the Entomological Society of Ontario. That of *major* I cannot locate. But the new species requires a name and I think it best to give it one, in view of the projected Canadian list, at the

small risk of creating a synonym, supposing the other names to be now recognizable.

229, a. *M. morana* Smith (Ent. News, XXI, 361, Oct. 1910). —*oregonica* Grt., in part. The form I had listed as "var. *oregonica* Grt." Smith subsequently described as *morana*, and the species is certainly not a variety of *trifolii*.

I am under the impression that Grote described a mixture of two species as *oregonica*, and attached a type label to one of each. In the British Museum is a female type *oregonica* and those other specimens from Oregon which seem to me certainly distinct from *trifolii*, though Hampson makes them "Ab. 2 greyer, fore wing more thickly irrorated with pale brown." In the New York Museum are five Colorado specimens which I took to be the same species. This form, besides being more thickly irrorated and greyer, differs from *trifolii* in having less of a W in st. line, and the terminal space not darker than subterminal, or scarcely so. I saw the form in Smith's collection, and it is probably the one he refers to as *oregonica* in his paper above mentioned. Together we agre d that it fitted Grote's description better than did *morana*. In the Brooklyn Museum I found a male type from Mt. Hood, Oregon, which struck me at once as the "var. *oregonica*" of my Calgary list. It is larger than the British Museum type, and browner, with a deeper W, and impressed me as distinct therefrom, especially as Mr. Doll showed me a long ser es like it from the Yellowstone. I have a Yellowstone female which I compared with it, though mine is distinctly ochreous throughout. By the descr.ption this is evidently *morana*. I have taken no more than one specimen at Calgary, but have one from Laggan (July 17th) and it occurs at Kaslo and elsewhere in B. C. I have no specimens quite like the British Museum type in my collection, and am not positive that Grote's name really involves two species, but if it does, then by the strict law of priority, as the ma'e sex in such cases should hold the name, *oregonica*, male type at Brooklyn, would have preference over *morana*. That law having been voted down, it remains to be decided whether *morana* shall stand.

300. *M obesula* Smith.—High River (Baird) and Red Deer River.

303. *M. picta.* Harris.—High River, May 31st, 1910 (Baird), Red Deer River, July 7th, 1905. Apparently rare in Alberta.

313. *M. ectrapela* Smith.—Two specimens at timber line on Mt. St Piron, Laggan, on July 17th and 18th, 1907, about 7,000 feet.

315. *M. lucina* Smith.—In Prof. Smith's collection I found a figure of the type of *vau-media* from Colorado. The description is made from a single specimen collected by David Bruce, and is stated in Smith's Catalogue to be in the collection of Mr. Jacob Doll. A Calgary specimen in Smith's collection was almost exactly like the figure. The t. a. and t. p. lines are direct, and meet about the middle of the inner margin, forming a V, giving the name to the form which has a striking appearance. I do not imagine it to be anything but an aberration of *lucina-olivacea*, but the resemblance of the Calgary specimen to the type is rather peculiar. Without seeing the type I have no wish to condemn the name, which Hampson lists as a species "incog." but I have no intention of recording *vau-media* as a species from Calgary.

318. *M. larissa* Smith.—I agree with Sir George Hampson in making this a synonym of *anguina* Grt.

319. *M. vicina* Grt.—Since publishing my notes I have studied a good deal of material under the names *pensilis* and *vicina*, including both types, with the result that I have found that Calgary specimens are really most typical of the former. The type of *vicina* is from the Eastern States, that of *pensilis* is from Vancouver Island. The latter has the subterminal line less distinct, more direct, and has less prominent preceding dashes. I have a good series of this from the type locality, and a Kaslo series is only rather more strongly marked. All material from Alberta to the Atlantic coast, and from Utah, I have arranged under *vicina*, but do not believe that there is really any specific distinctness, and specimens from Manitoba and Saskatchewan would fit either series equally well. Sir George Hampson treats them as two species but I have failed to apply the separation given in his tables. "*Vicina*; fore wing moderately broad, reniform extending well below cell," and, "*pensilis*, forewing narrow, reniform extending slightly below cell." These characters seem very variable.

322. *Scotogramma luteola* Smith= *phoca* Möschl.—The reference is Sir George Hampson's, and with the evidence at my disposal I

prefer to accept it. *Phoca* was described from Labrador and there is a specimen from there in the British Museum from the Standinger collection agreeing with Laggan specimens, though there are none there from Calgary as stated in the Catalogue. The *phoca* of Prof. Smith's collection was *Anarta impingens* Walker, which he also had elsewhere under its correct name. Möschler's figure certainly did suggest *impingens* rather strongly at first sight, but on closer inspection I agreed with Sir George Hampson that it really represented Smith's *luteola*.

323. *S. uniformis* Smith.—I have seen the type of this species in the Washington Museum and have a female in my collection taken by Mrs. Nicholl on Mt. Saskatchewan in the Rockies of Northern Alberta, on July 27th, 1907. Other specimens taken by Mrs. Nicholl are in the British Museum, some of them apparently mixed with *phoca*, which it resembles most nearly, but from which it is probably distinct. It is a large species, and generally more uniform in colour, as figured in Holland's Moth Book, Pl. XXIV, fig. 26, under the erroneous name of *inconcinna*. Hampson's figure of a Colorado specimen is not good, and is not certainly this species. Other records which I have of this species from Alberta are, Mt. Athabasca, 7,500 ft., July 27; Sheep Mountain, July 30th; and Broboktan Creek, Aug. 12th, 1907. Mr. Sanson has taken what I believe to be the species at Banff, July 21st, below 5,000 feet. Some specimens resemble the following.

324. *S. infuscata* Smith.—This is the species I had listed as "*phoca* Moeschl.?" which is probably prior to *luteola* Smith. Hampson makes *promulsa* prior to *infuscata*, though Smith objected to the synonym, stating that Hampson's figure of a Colorado specimen was *infuscata*, and not *promulsa* (Journ. N. Y. Ent. Soc., XV, 151, Sept. 1907). I must leave *promulsa* out of consideration for the present, as I have no means of identifying it, but my No. 324 is less brown than Hampson's figure, though not ochreous enough for true *infuscata*, of which I have seen the types from Park Co., Colo., 10,000 ft., and Gibeon Mt., Colo., 12,500 ft.

325. *S. perplexa* Smith.—This I had listed as *inconcinna* on Smith's own authority, on the strength of which also I permitted Sir George Hampson to figure one of my specimens under the name. The specimen figured is in my collection, though the

figure is not very good of it. The species, however, does not resemble *inconcinna* in the very least The type of that species, a female from Colorado, is in the Washington collection, and I associate it closely with *Mamestra oregonica* and *M. morana*. The description says; "It agrees with *submarina* in the peculiar modification of the last ventral segment, which is carinate at middle and foveate at each side." This seems as applicable to *morana* Smith as it is to *submarina*. Under *perplexa* I have in my collection specimens from Calgary and Laggan, Alta., Kaslo nd Nelson, B. C., and Provo, Utah. Those from the latter locality are the palest of the series, and are evidently the same species as that figured by Barnes and McDunnough from Stockton und r this name. The series shows considerable variation in the distribution of the shades, and the paler specimens are nearer *sedilis*, which seems only a variety. Dr. Dyar records it as *sedilis* in the Kootenai list, and the *sedilis* of Sir George Hampson does not differ. Mr. Sanson has taken the species at Banff, July 15th to 27th. *Subfuscula* Grote is doubtfully distinct.

(To be continued.)

## THE BEE GENUS HOPLITELLA.

In Canadian Entomologist, 1910, I described a genus of bees from California as *Hoplitella*. I now find that the same name was applied by Davidson in 1909 to a genus of Bryozoa. I propose to change the name of the bee to *Hoplitina;* type *Hoplitina pentamera* (Ckll.) = *Hoplitella pentamera* Ckll. 1910.

T. D. A. Cockerell.

*Hepialus auratus* Grote.—I am glad to be able to report having captured a specimen of this beautiful moth at St. Therese Island, about 3 miles from St. Johns, Que., on July 10, 1912. This is the second specimen recorded from Canada, the other having been taken by Dr. Fyles in Brome Co., Que., in July, 1865.

G. Chagnon, Montreal.

## THE BEE-GENUS THRINCHOSTOMA IN ASIA

BY T. D. A. COCKERELL, BOULDER, COLORADO.

In 1891 Saussure described *Thrinchostoma*, a very remarkable genus of Halictine bees, from Madagascar. Since that time several species of the same genus have been found to occur in Africa, and we have come to look upon *Thrinchostoma* as one of the most characteristic members of the purely Ethiopian bee-fauna. Yesterday I received a box of bees from Mr. F. W. L. Sladen, and in it were two specimens marked "genus?", collected by him in the Khasia Hills, India, in 1895. To my utter astonishment, I recognized a perfectly typical member of *Thrinchostoma*, even to the unique patches of hair on the wings of the male! Thus a genus of bees is added to the fauna of Asia, and we are warned once again of the probable errors arriving from imperfect data on insect distribution. The study of fossils has indicated that the several groups of insects were formerly more widely distributed than at present, and so explains the occurrence of species stranded as it were, in remote regions, far from their nearest relatives.

*Thrinchostoma sladeni* n. sp.

♂.—Length about 12 mm. (head extended), expanse nearly 19; head and thorax black, with the usual short white hair; inner orbits concave; clypeus greatly extended as usual in the genus, its broad apical margin and the labrum cream-colour, but the sharp simple mandibles rufopiceous; molar space about as broad as long; clypeus shining, distinctly but not densely punctured; upper part of front shining and finely punctured, but its lower two-thirds dull and opaque; scape wholly dark; middle of mesothorax and scutellum brilliantly shining, with scattered minute punctures, but margins, especially broad anterior corners of mesothorax, duller and minutely rugulosopunctate; area of metathorax triangular, finely rugosopunctate; tegulæ light testaceous wings hyaline, slightly brownish, especially on apical margin; nervures and stigma dark rufous; b. n. falling a considerable distance short of t. m.; submarginal cells subequal, the second very broad; first r. n. joining second s. m. almost at end; second t. c. running through a patch of black hairs; legs red-brown, the basitarsi (except more or less at apex, and the hind ones on inner side) creamy white; anterior tibiæ clear red in front; hind

femora incrassate, arched above, flattened and concave beneath; hind tibiæ incrassate, whitish above near apex, and below produced into a large flattened white apical lobe, which carries on its surface the widely separated spurs; abdomen claviform, narrowed basally; th first segment (except a dusky apical cloud), and the second except a transverse band (narrower in middle) clear ferruginous; rest of the abdomen black, with the hind margins of the segments broadly colourless hyaline; venter light red beneath as far as the fourth segment, which is broadly emarginate; fifth segment dull black emarginate.

♀.—More robust, the produced clypeus very broad, clear ferruginous (as also part of supraclypeal area), flattened and impunctate in middle, strongly lobed at sides, the shining sparsely punctured sides of face forming an acute angle on each side between the clypeus and its lobe; labrum and greater part of the broad bidentate mandibles clear red; sides of face and lower part of front with short golden tomentum; scape reddened apically; apical half or more of flagellum obscurely reddish beneath; hair of thorax (dense on prothorax above) pale fulvous; disc of mesothorax more strongly and closely punctured; area of mesothorax with small basal plicæ; first r. n. entering basal corner of third s. m.; third s. m. broader above; legs with golden hair; anterior tibiæ and tarsi, and middle tibiæ in front, clear red; only the first abdominal segment red, with a pair of subapical brown spots; second segment with the broad apical margin orange; the shining short hairs of the apical margin are golden on the second segment, but white on the others.

*Hab.*—Khasia Hills; the male is the type. The female is dated June. The sexes differ sufficiently to suggest that they may represent two species, but they are probably identical. The male is quite similar to the African *T. orchidarum* Ckll., differing principally by the claviform abdomen with red base, and the much less broadened hind tibiæ. The fifth ventral segment of *T. orchidarum* carries a broad dense brush of hair, wanting in *T. sladeni*.

It is perhaps possible that the Indian *Halictus wroughtoni* Cameron is a *Thrinchostoma*, although Bingham's figure of the male shows ordinary hind legs and gives no indication of hair-patches on the wings. It is in any event distinct from *T. sladeni*.

# INQUIRY INTO THE RELATIONSHIPS AND TAXONOMY OF THE MUSCOID FLIES.

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Dissections of the female reproductive system and studies of the eggs, first-stage maggots and reproductive habits of these flies, carried on for the past five years, have proved a golden key for unlocking many of the secrets connected with their relationships. Throughout the work, however, the problem of harmonizing these characters with those of the external adult anatomy has been a difficult one. At first sight the results seemed to indicate that the family groups heretofore recognized do not exist in the commonly accepted sense. The ordinary divisions seemed almost untenable, being often at variance with the results of the dissections or with external adult characters of well known utility.

It was soon evident that no satisfactory classification could be built up on the reproductive system characters alone. As examples of the disagreement between reproductive and external adult characters, the *Phasiidae* show in part flat-ovate macrotype eggs without uterus, in part elongate eggs deposited subcutaneously, also without uterus; and, if the Rutiliine and related flies are included in the family, in part elongate subcylindrical eggs hatching in an elongate uterus. The *Exoristidae*, after being restricted greatly from their former limits, are still more markedly differentiated in type of reproductive system and egg, showing not only the three Phasiid types but a half dozen or more additional ones as well.

It is now quite apparent that the external adult characters can not be subordinated to the reproductive characters in quite a good many cases, though they can so be in other cases. It seems practically certain, for example, that parallel specializations of the reproductive system have arisen quite independently in these flies, and that marked and parallel differentiations of the facial plate have so arisen with far less frequency. Facial plate differentiation is largely dependent on a greater or less lapse of oral and antennal functions, and such lapse is not of frequent occurrence. Reproductive system and egg modifications manifestly play an extensive part in the economies of these flies, wherefrom we may conclude that the reproductive system is plastic in a greater degree

than is the facial plate. Subtribal to subfamily should be attributed to the characters of the reproductive system, eggs and first-stage maggots, with family values under certain circumstances. When the true or incubating uterus is present its main type is a character of high value. The structure of the egg-chorion and certain structural details of the first-stage maggot are characters of still higher value. When such characters as these are supported by others they may well be used in family definitions. Practically all the early-stage, egg and reproductive-system characters are especially important and serviceable to us as indicating positively the natural limits of taxonomic groups, whereby we can with certainty draw a fixed line between those groups whose individual forms often can not be separated on the external adult characters.

A classification of the Muscoidea into family divisions founded on the general character of the egg, whether elongate-subcylindrical or flattened-ovate, is quite out of the question considering the external characters of the flies themselves; one founded on elongate uteri, or the absence of uterus, or on maggots developing in the uterus, would result similarly in an artificial and unnatural grouping. This may be realized by studying the tabular summary at the end of this paper. But there are certain other characters exhibited here that will apply to family divisions. For example the old family *Sarcophagidae* may well be restored in a new sense on the characters of the cordate and V-shaped uterus, both types being a double-sac specialization of the uterovagina quite distinct in character from all the other forms of uterine specialization in the Muscoidea. This division is strengthened by the generalized character of the cephalopharyngeal skeleton in the first-stage maggot of most of the forms, and by the deeply-sunken anal-stigmatic cavity of all the maggot stages. Employing the uterine character it becomes now for the first time possible to define positively and accurately the limits of this family.

It now seems equally desirable to restore the old family *Dexiidae*, but in a new sense, on a combination of facial plate and accessory supporting characters, definitely limited by the reproductive and especially by the first stage cephalopharyngeal characters. This is a natural group intermediate in facial-plate evolution

between the Muscid-Masiceratid stocks on the one hand and the Megaprosopid-Cuterebrid stocks on the other. We return at this point to an approximation of the group concepts of Schiner, who had an excellent eye for main natural distinctions in the Diptera.

The Megaprosopid type is clearly, though not closely, allied with the Dexiid, but its facial plate structure is closer to the Oestrid type than to the Dexiid, while the uterus and first-stage maggot as well as the cephalopharyngeal skeleton of latter differ markedly from those of the Dexiidae; hence it is advisable to maintain the group separately for the sake of uniformity. There has been a differentiation of the facial plate in the *Sarcophagidae*; the Paramacronychiine, Miltogrammine and Macronychiine types exhibiting a successive specialization in the direction of the Dexiid and Megaprosopid-Oestrid types. This is a case in which the facial plate characters are subordinated to the reproductive. It must be noted that the family group *Dexiidae* as restored does not include the many forms of the Pseudodexiine and Pyrrhosiine types, all of which have the Exoristid facial plate, though many of them possess pubescent and even densely plumose arista.

There are two large and taxonomically very practicable groups heretofore left in the *Exoristidae* that may most advantageously be accorded family rank at the present time. These are the microtype-egg forms with leaf-oviposition habit so far as known, which constitute the *Masiceratidae*; and the minute-platelet, coloured-maggot forms with foliage-larviposition habit so far as known, which constitute the *Hystriciidae*. There are three main categories of the former differing in the shape of the maggots and eggs; besides which there are numerous types differing in the structure of the chorion, which quite certainly indicates much diversity of origin. Yet they form a group easily defined on dissection of the females, and taxonomically quite as tenable as the *Oestridae* and several other long-accepted families.

The group of which *Phasiopteryx* is the type merits family rank on the remarkable and, so far as yet known, unique change of the eggs in the uterus from microtype ovate to macrotype subcylindrical, indicating wide separation from other stocks; not to mention the very exceptional structure of the first-stage maggot, which is no doubt largely adaptive.

The Cuterebrine flies are likewise too aberrant a type to be longer included in the same family with any of the other groups. They seem to have sprung from some old Mesembrinine stock, but are to-day well removed from their nearest living relatives.

It is now 23 years since Brauer and von Bergenstamm used the names *Masiceratidae* and *Hystriciidae*, but in different senses from those here employed. The family names must be accredited to them, since they employed them for the family types. The *Masiceratidae* as here revised includes but a fragment of the group to which they gave the name, only two of their genera so far as we yet know falling in it, these being *Masicera* and *Ceromasia*. But it takes in many of their *Phocoreratidae* and *Blepharipoda*, all of their *Willistoniidae* and *Goniidae*, their section *Myxexorista* (1893) and some at least of their *Baumhaueriidae* and *Germariidae*, The *Hystriciidae* as here revised includes all of their *Hystriciidae* except *Tropidopsis* which belongs in the Pyrrhosiine subfamily (*Hexamera* is not known to me), all of their *Tachinidae*, *Tachinoidae*, *Micropalpidae* (*Homoeonychia* unknown to me) including their section *Erigone* (1893), and a very few of their *Pyrrhosiidae*. It is profitable to note these comparisons as showing how nearly these authors in certain cases approached and how widely in others they deviated from proper definition of the groups on a study of the external adult characters alone.

If the peculiar reproductive and early-stage characters of *Phasiopteryx* are found to exist in *Oestrophasia*, the family will take the name *Oestrophasiidae* B. B. (1889). The name *Cuterebridae* was used in the present sense by Brauer and von Bergenstamm in 1889, but the family was ranked as an "Unter-Gruppe."

The *Sarcophagidae* of the present paper includes a large part of the *Sarcophagidae* B. B., a part at least of their *Rhinophoridae*, probably a part of their *Phytoidae*, probably all of their *Miltogrammidae* and *Paramacronychiidae*, and *Macronychia* alone of their *Macronychiidae*. In 1893 they referred *Melanophrys* to their *Paramacronychiidae*, but this genus belongs to the *Hystriciidae* of the present paper. The *Dexiidae* as here revised includes practically all of the *Dexiidae* B. B., and nearly all of their *Paradexiidae*.

From various comparisons we are able to judge with considerable certainty that the characters of the less adaptive struc-

tures of the egg and first-stage maggot are, on the whole, of prime taxonomic rank in the Muscoidae. They are therefore available for family definition in the case of large groups or pronounced types where other characters fail us. We may also justly conclude that the reproductive system and general egg and maggot structures furnish characters of inferior rank but of great service in the definition of such taxonomic categories as genera, group-units, subtribes, tribes and subfamilies, and even at times of families if they are supported by other important characters.

A comparative study of plant and animal taxonomy suggests (1) that the eggs, embryos, early and adolescent stages of animals will always furnish us the main key to their affinities whether such is present or lacking in the adult; (2) that the characters of the reproductive system, while of less rank, will enable us to fix definitely the limits of the lower taxonomic categories when their definition is obscured in the adult; and finally (3) that the more a structure becomes specialized, the more the taxonomic value of its characters contracts. The first point justifies the erection of the eleven families outlined and recognized in this paper. The last point emphasizes again the extreme taxonomic difficulties that exist in the muscoid flies, which are undoubtedly not only among highly specialized but also among the most recently specialized of all arthropods and hence the most difficult to classify in a convenient system. However much the values of certain characters may contract, in other words however obscured may become the group relationships in the structures exhibiting these characters, we are nevertheless often compelled, in the absence of others more distinctive, to use them if we wish to define certain of the higher taxonomic categories. Thus, in order to attain the greatest degree of clearness and practicability, we should in actual practice limit our main group-definitions to the fundamental group-categories or lowest groups of genera in these flies, which have been called group-units. Each group-unit consists of the *typic genus* together with those *atypic genera* which are found to be more closely related to it than to any other typic genus. For definition of typic and atypic genera, see Tax. Musc. Flies, p. II.; and for many pertinent considerations, pp. 7–13. As an example, *Exorista* may be taken as a typic genus, and *Euphorocera* as an atypic genus belonging

with it; these together form a basis for the Group-unit *Exoristiæ*.

The eleven family types indicated in the diagram farther on show pronounced adult characteristics which cause them to stand forth prominently, as in bas-relief, from the mass of the Muscoidea. These characteristics are reinforced by valuable characters drawn from the eggs, early stages and reproductive system. But the limits of the groups which these eleven family types represent are often greatly obscured in the external anatomy of the adult, and it is the function of the egg, early-stage and reproductive characters to clear up this obscurity in all cases. This is the first time in the history of muscoid taxonomy that we have had the means of definitely segregating these various families and accurately determining their limits, and they may well be maintained now on the sum-totals of their respective characters. But in synoptic treatment, as will appear later, these family groups are unwieldy and do not aid us as such, though their divisions may be employed as leading directly to the group-limits.

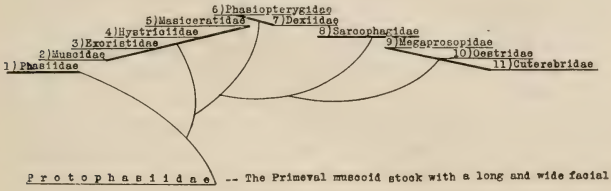
The characters of the facial plate apparently continue to hold better in the main for the indication of family types than do those of any other single external adult structure. They become subordinated to the characters of the female reproductive system and early stages occasionally, as in the case of the Sarcophagidae and Dexiidae, but this is in accordance with the well-known law of contraction of values, and the consequent fluctuation of characters, which cannot hold for all groups. They are reinforced by various other external adult characters in the several groups. Where they fail from lack of differentiation to mark off otherwise prominent groups, the characters of the first and second categories are always available. The following scheme of derivations illustrates well, reading the group from left to right, the successive retrograde modifications of the facial plate that appear to have taken place in these flies.

(1) Phasid stem (Facial plate remains wide and elongate).

(2) Muscid (3) Exoristid (4) Hystriciid (5) Masiceratid stem (Facial plate shortens but remains wide).

(6) Phasiopterygid (7) Dexiid stem (Facial plate shortens further and becomes constricted below).

(8) Sarcophagid stem (Facial plate in the typical stock very




similar to that of the Muscid stem, but some stocks show a shortening of clypeus and inferior constriction of the facial plate, foreshadowing and even approximating those of the extreme types).

(9) Megaprosopid (10) Oestrid (11) Cuterebrid stem (Facial plate reaches extreme of clypeal shortening and epistomal constriction).

The lines of descent have not been simple, but on the contrary quite complex, and the plan merely indicates the general trend in facial plate modification. From the Phasiid to the Oestrid extremes the successively increasing differentiation may be traced in successive types of ever greater clypeal shortening and epistomal constriction. It seems almost certain that the facial plate has specialized according to the retrogressive evolution here indicated. There are several facts that appear to confirm this view quite conclusively. Australia possesses no endemic oestrid nor cuterebrid stock, but it has been the focus of a considerable number of forms which must be considered as survivors of primitive phasiid stock. These are *Rutilia*, *Amphibolia*, *Microtropeza*, *Paramphibolia*, *Amenia*, *Senostoma* and *Chrysopasta*. Certain relatives of these, also evidently to be classed as survivors of the same stock, occur in the Australasian or Austromalaysian regions and strengthen the case in hand. These are *Paramenia* of New Zealand, *Pseudoformosia* of New Guinea, *Stilbomyia* of Java, and others. It is to be noted that none of these, however, reaches either South America or South Africa. Both of these continents were apparently cut off from the Australian-Antarctic landmass at a time antedating the greater or main dispersals of that branch of the primitive phasiid stock which gave rise to these forms. These facts

indicate that the phasiid stocks are much older than the oestrid and cuterebrid stocks.

Other facts point to the same conclusion. The specialization toward partial and complete atrophy of the mouthparts in the oestrid stocks, toward partial atrophy of the same in the cuterebrid and megaprosopid stocks and toward antennal reduction in these and kindred stocks indicates that the extreme shortening and constriction of the facial plate are connected with a more or less complete loss of mouth and antennal functions. Certainly this is comparatively recent specialization, for the primitive stocks must have had highly functional mouthparts as well as high antennal development.

Facial plate reduction has probably followed antennal and mouth reduction. In other words it is a consequence of loss of nutritive and olfactory functions in the fly, and thus marks an extreme stage of parasitism and host-adaptation, particularly one in which the sexes may easily find each other, in which the female may easily find the host, and in which the maggots may easily store a large food-supply. The two muscoid stocks which are apparently of most recent evolution, the Masiceratid and Hystriciid, in which the mouthparts and antennæ are both still highly functional and the facial plate in consequence still retains its full development, have much less perfect host-relation, sex-relations and food-supply conditions. They must search assiduously for their hosts; the large fecundity which is necessary to their peculiar host-relations demands extensive feeding in the adult female, especially as she has not an unlimited food-supply during her larval life; and the necessity for feeding and host-searching makes the female a wanderer, whose discovery by the male calls for well-developed olfactory organs.

The comparison of *Cobboldia* with other types shows conclusively that pharyngeal atrophy (atrophy of pharynx and rostrum of proboscis, and not necessarily of haustellum or palpi, with more or less complete closure of pharyngeal cavity) is directly correlated with the evenly receding and gently-convex profile of the facial plate and peristomalia, and the consequent more or less complete recession of the epistoma; further that the great shortening of the clypeus is primarily dependent on and thus directly

correlated with antennal atrophy (atrophy practically only of the third joint, and consequent loss of olfactory function).

As correlated in importance with facial plate specialization among external adult characters but of less value, it is interesting to note that excessive macrochaetal development has taken place in several stocks and probably by parallelism. The following groups, arranged by families, exhibit spinose-macrochaetal specialization:—*Hystriciidae*, the climax of all (*Dejeanini*, *Saundersiini* pt., *Hystriciini*, and *Larvaevorini* pt.); *Masiceratidae* (*Blepharipezini*, *Belvosiini* pt.); *Exoristidae* (*Pyrrhosiinae* pt.—*Tropidopsis* and *Paragymnomma*); *Dexiidae* (G.-U. s. *Echinodexiæ*,*Tropidodexiæ*); *Megaprosopidæ* (G.-U. *Megraprosopiæ*); *Phasiidae* (G.-U. *Amphiboliiæ*).

The wisdom of separating the *Megaprosopidæ* from the *Dexiidæ* and of maintaining them on a par with and more allied to the *Oestridae* may be questioned. It may be argued that the presence of macrochaetae allies them more with the *Dexiidae*. We know, however, that their maggots are of peculiar structure, that of *Microphthalma* at least being quite thickly clothed with long bristly hairs and representing the extreme development of bristly vestiture in the first-stage maggots so far as known, while its cephalopharyngeal skeleton is of a distinct type from the dexiid. Their uteri are of markedly different type from the form typical of the *Dexiidæ*, being known to be very long and irregularly coiled in both *Microphthalma* and *Megaprosopus*. Their segregation is thereby demanded since these characters strongly reinforce those of the facial plate. The absence of macrochaetae in the oestrids is due to their aerial life-habit, which is not shared by the Megaprosopids.

It is possible, notwithstanding the facial and oral characters, that the *Trixodini* may be found on investigation of their reproductive system and first-stage maggots to belong with the *Dexiidæ* rather than with the *Megaprosopidae*. They almost certainly have a uterus of the continuous-canal type and it is quite possibly of the fat and shortened dexiid type, but the final test of family position here will lie in the type of pharyngeal sclerite possessed by the first-stage maggot. These flies are very rare, at least in collections. The only known specimens are two collected by myself on tree-trunks in the mountains of the Rio Gila headwaters in

New Mexico and the Sierra Madre of Chihuahua. During a trip across the Sierra Madre of Chihuahua and Sinaloa in August and September, 1909, I made especial search for these forms but found none. A similar search earlier in the season would probably have been successful. These flies are of unusual interest as exhibiting facial and oral characters intermediate between those of the *Megaprosopidae* and those of the *Oestridae*, while their weak macrochaetae show a further trend toward the latter family. It is probable that they parasitize wood-boring larvæ.

If, as seems very certain, *Rutilia* and *Amphibolia* represent an old stock, then uterine development must be of very long standing. Both forms have coiled uterus in which the elongate eggs hatch. Certainly a type without incubating uterus would seem to be the original, and elongate subcylindrical eggs should be the more primitive form. If this is true, we must go well back into the past for the beginnings of the remarkable specialization in reproductive system, eggs and maggots of these flies. These specializations have quite certainly been largely adaptive, and thus we are better prepared to accept their independent origin in several stocks. Ovate, flattened eggs are an adaptation for attachment to surfaces, the larger or macrotype forms being designed for fastening externally to host and the small or microtype forms for fastening to leaf-surfaces to be swallowed by host. Here is extensive adaptation even in size —a specialization to a microscopic egg that can be swallowed by leaf-feeding insects without injury to the contained maggot. This last specialization seems to have arisen independently in several stocks, since these eggs exhibit a wholly unexpected variety of structure, the choria of some being reticulate after a honeycomb pattern, those of others having a pattern of raised arcs or wrinkles, while some have a perfectly smooth and unreticulate chorion, and still others have the chorion finely or coarsely punctured or finely or coarsely set with raised points.

Pediceled eggs are for attachment to hosts in place of flattened eggs. If neither pedicel nor flatness can be secured, nor viscid secretion for gluing the eggs nor structures for depositing them subcutaneously, then in order to meet the requirements of parasitism the eggs must be held in the uterus until the maggots are

fully developed and have become highly active. Hence the need for special uterine development. So far as yet known no elongate unpediceled eggs are ever deposited on hosts except by the Gastrophiline Cobboldiine and Cuterebrine flies, whose eggs are provided with a profuse viscid coating for attachment by their lateral or latero-anal surfaces to the hairs of the host. In this connection it also becomes evident that forms affecting a host to which the fly can not gain access must possess a uterus in which to develop active maggots that can search for and penetrate to such hosts.

Some maggot-depositing flies, on the other hand, which have what would seem the most perfect access to the host are most careful to keep at a certain distance from the latter. Such are the *Hystriciidae* or leaf-larvipositing forms which are greatly specialized in their coloured maggots, long coiled strap-like uterus, consolidated cephalopharyngeal skeleton and excessive macrochaetal development. Their very divergent host-relations may be in part due to certain of their hosts living in webbed nests and being in the habit of spinning sundry silken threads both for enlarging and changing their habitations and for marking their feeding trails whereby they may retrace their way to the nest. Silken webs are especially dangerous to forms of excessive macrochaetal development; and it may be that there is some connection between this and the origin of this remarkable host-habit, with the consequent coloration of the maggot.

Even more consolidated than in the *Hystriciidæ* is the cephalopharyngeal skeleton of the first-stage maggot in the *Masiceratidæ* or leaf-ovipositing forms, in which his structure has reached the extreme of reduction and consolidation. This argues for a high degree of specialization here, of longer standing than that of the leaf-larviposition forms. The conclusion is borne out by the elongate intestiniform uterus, microscopic size of the egg, and the remarkably divergent host relations whereby it becomes necessary fully to develop the maggot within the chorion without allowing it to escape therefrom until it shall have arrived in the alimentary canal of the host, notwithstanding that it may remain for a considerable time deposited and unswallowed. Such provisions mark an extreme specialization of very long standing. How these microscopic eggs could have originally arisen from a

larger type, as we must needs conclude they have done, in sufficient mode to become established, necessitating corresponding marked changes in the oviposition habits and thus in the instincts of the female, is a fascinating problem for solution. It seems certain, moreover, that such eggs have arisen independently in several different stocks, but probably largely through parallelism due to evolution trend.

The flies with subcutaneous host-larviposition habits and those with subcutaneous host-oviposition habits are likewise much specialized. The remarkably specialized piercers, larvipositors, ovipositors, combinations of these, and accessory structures such as the ventral carina and its spinules denote high specialization. During copulation the piercing structures have evidently to be extended or thrown far backward, in the *Compsiluriæ* at least, for effecting the union of the vaginal orifice with the male.

While *Phasiopteryx* appears to be a waning survivor of an old stock with dexiid affinities, it exhibits a large amount of specialization in its very long and slender uterus and especially in its very differentiated isopodiform maggot with chitinized segmental lateral and dorsal plates. But what holds the utmost attention and interest in this form is the wholly unique character of the ova accomplishing in the upper part of the uterus their final growth or increase in size to the fully formed macrotype egg, which should by analogy with other macrotype-egg forms have been completed in the ovarioles. This seems difficult of explanation and, of course, at once suggests some connection with the microtype-egg or leaf-ovipositing forms. But *Phasiopteryx* is to all appearances of external structure far removed from the microtype-egg stocks. Its uterus is very similar in general form to that of the *Phasiatactiæ* and *Cnephalomyiiæ*, both of which have an elongate and more or less pointed microtype egg that is flattened ventrally. Its facial plate is not so divergent in type as to preclude a common origin with the masiceratid stocks. It seems probable that we must look on *Phasiopteryx* as a remnant of an offshoot from some ancient microtype-egg stock. If this view is correct, we may expect important light on phylogeny of the microtype-egg stocks from a thorough study of this genus and its allies. It appears quite

certain from the facts in the case that the ancestors of *Phasiopteryx* possessed a microtype egg.

It is a general rule throughout the Muscoidea that those groups with greatest fecundity comprise parasitic forms whose host-habits afford their maggots the least favourable opportunity for encountering the host. Conversely the opposite is the case. The fecundity runs highest in the *Masiceratidæ* and *Hystriciidæ*, leaf-ovipositing and leaf-larvipositing parasitic forms, the latter exhibiting the extreme Thus we may conclude that in these groups there occurs the highest maggot mortality. Those forms which are parasitic in white grubs, wood-boring grubs, and hosts in general which the maggot must seek out for itself with limited chance of finding them also have a high fecundity. The *Myiophasiiæ*, which are weevil-grub parasites, have a much lower fecundity, and it is evident that their maggots usually reach the host. Forms which deposit eggs or maggots on the host also have a comparatively low fecundity, and those which inject the maggots or eggs subcutaneously have a still lower fecundity. The typical Sarcophagine flies, which are non-parsaitic in the strict sense, show on the whole the lowest fecundity of all, due to the nature of their larval food-substances on which the highly active maggots are deposited and which is ordinarily bountiful for their needs.

The Sarcophagine flies have perhaps developed maggots *in utero* on account of the generally perishable nature of their larval food-substances, combined with a fairly long incubation period necessary to the development of the maggot. On the other hand the muscine and calliphorine flies have not done so, on account of a marked difference in the nature of their food-substances which are in general less perishable, combined with an incubation period sufficiently short to meet the conditions and requirements of oviposition. It may be here pointed out that the most generalized type of cephalopharyngeal skeleton so far known in the Muscoidea is that exhibited in the first-stage maggots of the Sarcophagine flies and their allies. Evidently the sclerites have here remained almost unspecialized, being unreduced and freely articulated, as best fitted for their larval life-habit.

Returning again to taxonomic considerations, it is necessary to point out more fully that however well the family types al-

ready outlined may stand forth on general characters, it is nevertheless true that the recognition of the family groups which they typify does not facilitate synoptic treatment. Their employment does not elucidate the subject, but rather obscures it. They are often incapable of concise limitation and hence of compact synoptic definition on either external, reproductive or early-stage characters. Thus it is necessary to sidetrack them in actual synoptic practice and drop to lower categories. The group-unit is the category that here lends itself most conveniently to taxonomic manipulation. The reason for this lies in the fact that the characters of the reproductive system, egg and early stages, which can not always be conveniently interpreted as of family value, and often of subfamily or even of subtribal value, are much more pronounced and readily apparent, therefore more comprehensive, than those characters of the external anatomy of the fly which largely mark convenient family to subtribal divisions. While the characters of the facial plate and various supporting characters of family to subtribal importance exhibited by other external adult structures are often by themselves almost impossible of correct interpretation, so much so that hardly any two persons can be expected to read them alike, those of the reproductive system, egg and early stages are unmistakable and impossible of confusion.

Such external adult characters as the more or less ciliate facialia, degree of hairiness of eyes, apical cell ending at or near wing-tip, presence of true macrochaetae, hind tibiæ ciliate or pectinate, relative length of aristal and antennal joints, relative development of antennæ, mouth-parts and palpi, and especially exact plan of facial plate specialization including degree of constriction by vibrissal angles and their comparative degree of removal from the oral margin with the conformation of latter, in fact the majority of the external adult characters in these flies, are very difficult to describe accurately and few persons will be able correctly to interpret the descriptions in any event. Moreover these characters indicate close relationships only in certain cases, while in others they are the result of evolutional trend in stocks considerably removed from each other. For this and other reasons their value runs out at times. In certain groups

some of these characters become highly untrustworthy, though they may hold good throughout other groups. It is often quite impossible to decide their values correctly without the aid of the reproductive and early-stage characters to guide us in the matter of close relationships. An intricately interrelated system of specialization in external adult anatomy has resulted in producing in distinct stock forms which closely approach each other in external characters. This was not realized until the investigation of the reproductive and early-stage characters had considerably progressed.

Until this work was well under way no one could interpret the genera as they actually exist, and all generic work was largely guess-work. Even at the present time muscoid genera as they commonly appear in the literature are in numerous cases complexes of widely different stocks. Forms belonging to distinct families have for a century been classed as congeneric, and the external differences between them are sometimes so inconspicuous that careless workers have even pronounced them conspecific. These facts serve to emphasize the invaluable aid to be derived from the reproductive and early-stage characters, and the necessity for taxonomic manipulation of the superfamily by means of smaller groups than families, subfamilies, tribes, and subtribes.

The following tabular summary will be useful. It shows the known main differentiations of the female reproductive system, eggs and first-stage maggots in the eleven muscoid families here recognized, exemplified by group-units. The group-unit consists, as already stated, of the typic genus plus the atypic genera which belong with it, and is a division of the subtribe.

Its ending is *iæ*, which is added to the root of the name of its typic genus.

| | |
|---|---|
| I. PHASIIDÆ | 1. Elongate macrotype eggs deposited subcutaneously without incubation, no uterus—Phasiiæ. |
| | 2. Flattened subovate macrotype eggs deposited supracutaneously without incubation, no uterus—Ectophasiiæ, Trichopodiæ, Xanthome- |

I. PHASIIDÆ
(Continued from page 51.)

lanodiæ, Cistogasteriæ, Rhodogyniæ.

3. Elongate subcylindrical macrotype eggs hatched in coiled uterus—Rutiliiæ, Amphiboliiæ.

II. MUSCIDÆ

1. Elongate subcylindrical macrotype eggs, no uterus—Musciæ, Stomoxydiæ, Calliphoriæ.
2. Elongate macrotype eggs incubated in uterus, deposited as free maggots or maggots in choria—Mesembriniæ, Hypodermodiæ, Eumusciæ.
3. Elongate macrotype eggs hatched in uterus and maggot carried to or through its third stage therein—Dasyphoriæ, Glossiniæ.

III. EXORISTIDÆ

1. Flattened ovate macrotype eggs deposited supracutaneously without incubation, no uterus—Exoristiæ, Plagiopiæ, Winthemiiæ, Neophoroceratiæ, Chactotachiniæ.
2. Flattened subovate macrotype eggs incubated but not hatched in coiled uterus, deposited supracutaneously—Meigeniiæ, Vivianiiæ, Cyrptomeigeniiæ, Thrixioniæ.
3. Elongate subcylindrical pediceled macrotype eggs incubated but not hatched in coiled uterus, deposited supracutaneously—Carceliiæ.
4. Elongate macrotype eggs deposited subcutaneously without incubation, no uterus—Phaniiæ, Hemydiæ, Leucostomiæ, Dionaeiæ.
5. Elongate macrotype eggs hatching

to white maggots, slender coiled uterus, the maggots deposited subcutaneously—Compsiluriæ, Celatoriiæ, Oxynopiæ, Weberiiæ.

6. Elongate macrotype eggs hatching to white maggots in slender coiled uterus like preceding, but the maggots deposited supracutaneously—Pseudomyothyriiæ, Hyalomyodiæ, Thryptoceratiæ.
7. Elongate subcylindrical macrotype eggs hatching to coloured maggots in coiled very long and slender to fat gut-like uterus, the maggots deposited near host—Eugymnochaetiæ, Bigonichaetiæ, Glaucophaniæ, Eriothryginæ, Macquartiiæ, Ophirioniæ, Steinielliæ.
8. Elongate macrotype eggs hatching to white maggots in short, fat gut-like coiled uterus, the maggots deposited near host—Eumyobiiæ, Pyrrhosiiæ, Ophirodexiiæ, Atrophopodiæ, Thelairiæ.
9. Elongate subcylindrical macrotype eggs hatching to white maggots in coiled strap-like uterus, the maggots deposited supracutaneously—Zygosturmiiæ, Azygo bothriiæ, Voriiæ, Siphosturmiiæ, Eryciiæ.

III. EXORISTIDÆ
(Continued from page 52.)

1. Elongate subcylindrical macrotype eggs hatching to coloured maggots in long coiled strap-like uterus, the maggots deposited on foliage near hosts—Melanophryoniæ, Ernestiiæ, Micropalpiæ, Copecryptiæ, Servilliiæ, Larvævoriæ, Hystriciiæ, Saundersiiæ, Dejeaniiæ.

IV. HYSTRICIIDÆ

V. MASICERATIDÆ

1. Microtype flattened—subovate eggs in coiled subtubular slender to fat uterus, incubated to full development of the shortened subovate maggot but not hatched therein, deposited on foliage near hosts to be swallowed by latter in feeding (chorion varying from gray to yellow and black in colour and exhibiting a great variety of minute structure) — Ceromasiopiæ, Epidexiiæ, Phasmophagiæ, Baumhaueriiæ, Ophirosturmiiæ, Eusisyropiæ Ommasiceratiæ, Dimasiceratiæ, Metopiopiæ, Euceromasiiæ, Euexoristiæ, Eumasiceratiæ, Masiceratiæ, Brachymasiceratiæ, Sturmiiæ Otomasiceratiæ, Chætophoroceratiæ, Gaediiæ, Germariiæ, Atactiæ, Triachoriæ, Belvosiiæ, Blepharipeziæ G.-U. s.
2. Microtype flattened elongate pointed or oval eggs, incubated and deposited same as preceding but maggot elongate, uterus very long and slender (chorion black)—Cnephalomyiiæ, Phasiatactiæ, Salmaciiæ.
3. Microtype slightly flattened, elongate-subcylindrical eggs, incubated and deposited same as preceding, uterus very long and slender (chorion smoky-yellowish) — Cylindromasiceratiæ.

VI. PHASIOPTERYGIDÆ

1. Microtype slightly flattened ovate-rounded eggs, growing in the upper part of uterus to macrotype elongate subcylindrical eggs which hatch in lower part of uterus

VI. PHASIOPTERYGIDÆ
(Continued from page 54.)

to maggots with chitinized dorsal and lateral segmental plates, the maggots deposited where they must seek the host for themselves, the uterus extremely long and slender—Phasiopterygiæ.

VII. DEXIIDÆ

1. Elongate subcylindrical slender macrotype eggs sharply pointed at anal end, hatching to white maggots with anal setæ borne at ends of anal stigmatic processes, the maggots deposited in choria on soil which they enter in search of white grubs, uterus fat and gut-like—Billæiæ, Microchaetiniæ, Mochlosomiæ, Dexiiæ (I am not certain that the last two groups possess the anal setæ of maggot, nor that the second group is parasitic in white grubs, but both are indicated by my studies).
2. Elongate subcylindrical macrotype slender eggs, hatching to white maggots with anal stigmatic processes but lacking the anal setæ, the maggots deposited at entrances of galleries of woodboring grubs to which they penetrate, uterus fat and gut-like—Sardioceratiæ, Eutheresiiæ, Paratheresiiæ .
3. Elongate subcylindrical slender macrotype eggs, hatching to white maggots in the very fat gut-like uterus, the maggots lacking both anal processes and setæ and evidently deposited near the hosts—Tropidodexiiæ. (In this group

the abdomen is rather densely set with subspinose macrochaetæ.)

4. Elongate subcylindrical macrotype eggs, hatching to coloured maggots in the fat gut-like uterus, maggots deposited near host—Myoceropiæ.

VII. DEXIIDÆ
(Continued from page 55.)

5. Very elongate subfiliform small macrotype eggs, hatching in the fat gut-like uterus to very slender subfiliform white maggots, which are deposited at weevil oviposition-punctures in various green fruits and buds, the maggots making their way to the weevil grubs inside—Myiophasiiæ.

VIII. SARCOPHAGIDÆ

1. Elongate subcylindrical macrotype eggs, hatching to white or yellowish-white maggots in a cordate double-sac uterus, the maggots deposited on the food-substance—Sarcophagiæ G. U.

2. Elongate subcylindrical macrotype eggs, hatching to white maggots in a V-shaped double-sac uterus, the maggots deposited in the nests of various wasps and bees where they feed on stored insect food when such is present and on the early stages of the host—Metopiiæ Eumacronychiiæ, Paramacronychiiæ, Miltogrammiæ, Macronychiiæ.

IX. MEGAPROSOPIDÆ

1. Elongate subcylindrical macrotype eggs, hatching in a very long irregular coiled uterus, the maggot clothed with long bristles—Megaprosopiæ.

X. OESTRIDÆ

1. Subcylindrical macrotype eggs rapidly tapered at anal end and with operculum at the obliquely-truncate cephalic end, incubated in uterus and attached by lateroanal surface to hairs of host by means of a viscid fluid—Gastrophiliæ.
2. Elongate subcylindrical pediceled macrotype eggs without operculum incubated in uterus and attached by the broad claspers of the pedicel to hairs of host by means of a viscid fluid, the chorion cleaving longitudinally for the escape of the maggot—Hypodermiæ.
3. Elongate subcylindrical macrotype eggs, hatching in uterus, the whitish maggots deposited free or in chorea in the nostrils of host—Oestriæ.

XI. CUTEREBRIDÆ

1. Elongate subcylindrical large macrotype eggs with heavy chorion and operculum at cephalic end, incubated in uterus and attached by lateral surface to hair or skin of host by means of a profuse viscid fluid—Cuterebriæ, Dermatobiiæ.

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## SOME HETEROPTEROUS HEMIPTERA FROM SOUTHERN PINES, N. C.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, N. Y.

The Heteroptera listed below were all collected by Mr. A. H. Manee, of Southern Pines, N. C., whose labours have made possible the preparation of this paper. It is interesting not only on account of the records of distribution, data of great value in themselves, but also because it represents the fauna of a restricted area. It is hoped that it will be of value as a contribution to faunistics.

February, 1913

*Euthyrhynchus floridanus* Linné.
*Mineus strigipes* H. S.
*Apateticus serieventris* Uhler.
*Stiretrus anchorago* Fabr. var. *fimbriata* Say.
*Mormidea lugens* Fabr.
*Solubea pugnax* Fabr.
*Euschistus servus* Say.
*Euschistus tristigmus* Say var. *pyrrhocerus* H .S.

There is also one specimen intermediate between the var. and the typical form.

*Euschistus crassus* Dallas.
*Neottiglossa undata* Say.
*Neottiglossa sulcifrons* Stal.
*Thyanta custator* Fabr.
*Nezara pennsylvanica* P. B.
*Nezara hilaris* Say.
*Banasa euchlora* Stal.
*Banasa dimidiata* Say.
*Brochymena 4-pustulata* Fabr.
*Brochymena annulata* Fabr.
*Stethaulax marmoratus* Say.
*Diolcus chrysorrhoeus* Fabr.
*Chelysoma guttata* H. S.
*Tetyra bipunctata* H. S.
*Cyrtomenus mirabilis* Perty.
*Amnestus pusillus* Uhler.
*Thyreocoris unicolor* P. B.
*Thyreocoris lateralis* Fabr.
*Thyreocoris pulicarius* Germ.
*Aradus falleni* Stal.
*Aradus curticollis* Bergr.
*Acanthocerus galeator* Fabr.
*Acanthocephala terminalis* Dall.
*Acanthocephala femorata* Fabr.
*Leptoglossus oppositus* Say.
*Leptoglossus phyllopus* Linné.
*Leptoglossus corculus* Say.
*Spartocera diffusa* Say.

*Chariesterus antennator* Fabr.
*Chelinidea vittigera* Uhler.
*Anasa tristis* Deg.
*Anasa armigera* Say.
*Alydus eurinus* Say.
*Alydus pilosulus* H. S.
*Megalotomus 5-spinosus* Say.
*Stachyocnemus apicalis* Dallas.
*Harmostes reflexulus* Say.
*Harmostes fraterculus* Say.
*Corizus lateralis* Say.
*Jalysus spinosus* Say.
*Largus succinctus* Linné.
*Arhaphe carolina* H. S.
*Arhaphe cicindeloides* Walk.
*Oncopeltus fasciatus* Dallas.
*Lygaeus facetus* Say.
*Lygaeus bicrucis* Say.
*Lygaeus Kalmii* Stal.
*Lygaeus turcicus* Fabr.
*Nysius californicus* Stal.
*Geocoris punctipes* Say.
*Phlegyas annulicrus* Stal.
*Oedancala dorsilinea* A. & S.
*Paromius longulus* Dallas.
*Perigenes constrictus* Say.
*Myodocha serripes* Oliv.
*Heraeus plebejus* Stal.
*Pamera bilobata* Say.
*Pamera basalis* Dallas.
*Antillocoris pallidus* Uhler.
*Cnemodus mavortius* Say.
*Ozophora picturata* Uhler.
*Cryphula parallelograma* Stal.
*Corythuca ciliata* Say.
*Corythuca arcuata* Say.
*Gargaphia angulata* Heid.
*Teleonemia belfragei* Stal.

*Reduviolus subcoleoptratus* Kirby.
*Reduviolus annulatus* Reut.
*Microvelia americana* Uhler.
*Gerris marginatus* Say.
*Barce uhleri* Banks.
*Barce fraterna* Say.
*Ploiaria carolina* H. S.
*Ploiariopsis hirticorins* Banks.
*Pygolampis pectoralis* Say.
*Narvesus carolinensis* Stal.
*Conorhinus sanguisugus* Lec.
*Arilus cristatus* Linne.
*Sinea diadema* Fabr.
*Melanolestes picipes* H. S.
*Rasahus biguttatus* Say.
*Sirthenea carinata* Fabr.
*Hammatocerus purcis* Drury.
*Apiomerus crassipes* Fabr.
*Apiomerus spissipes* Say.
*Pselliopus cinctus* Fabr.
*Zelus* (*Diplodus*) *luridus* Stal.
*Zelus* (*Diplodus*) *cervicalis* Stal.
*Zelus* (*Pindus*) *socius* Uhler.
*Fitchia aptera* Stal.
*Phymata fasciata* Gray.
*Phymata vicina* Handl.
*Macrocephalus prehensilis* Fabr.
*Lyctocoris campestris* Fabr.
*Triphleps insidiosus* Say.
*Acanthia ligata* Say.
*Gelastocoris oculatus* Fabr.

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# FURTHER NOTES ON ALBERTA LEPIDOPTERA, WITH DESCRIPTION OF A NEW SPECIES.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 34.)

326. *Anarta cordigera* Thunb.—Didsbury, June 11th, 1906; C. G. Garrett.

327. *A. melanopa* Thunb.—Common in the mountains, from just below timber line upwards. Middle July and Aug.

328. *A.*, sp.—This cannot be *quadrilunata* of which I have seen the type from Colorado in the British Museum, and have a similar specimen from the same state. The only other specimen of No. 328 that I have seen is the ♀ before mentioned in Prof. Smith's collection, labelled July 25th, 1889.

329. *A. zetterstedtii* Stand.—Sir George Hampson in Can. Ent., XL., 104, refers this form to *Sympistis zetterstedtii* Staud., recording a male and female taken by Mrs. Nicholl, on Mt. Athabasca, Alta., and Kicking Horse Pass, B. C. The species occurs in Northern Europe. The form is extremely near *lapponica*, and there are Labrador specimens under both names in the British Museum.

330. *A. zetterstedtii*, var. *labradoris* Stand.—This form so stands in the British Museum, but under *Sympistis*. I suspect it of being distinct from No. 329, but have only one specimen of the latter.

331. *Nephelodes tertialis* Smith,= *emmedonia* Cram.—In Ent. News, XXII., 397–401, I published some notes on this genus, and expressed the opinion that the Pacific coast *pectinatus* was possibly distinct, and at any rate recognizable as a variety. On the other hand *tertialis* does not seem in any way separable from eastern *minians*, to which *emmedonia* is merely a prior name.

333. *Leucania minorata* Smith,= *luteopallens* Smith,= *pallens* Linn.—*Minorata* was described in 1894 from California and Oregon, and compared with *oxygala* Grt.; "Smaller throughout, the ground

colour reddish, the secondaries darker." I have seen the type of *oxygala* Grt. (not *oxygale*) from Colorado, in the British Museum. It is a very smoky thing, with secondaries wholly dark, in fact darker than the types of *minorata*, or anything of this series that I have elsewhere seen. Sir George Hampson's figure of it is poor and misleading. The note I took the first time I saw the specimen was, "Suggests a melanic *minorata*. Suspiciously like European *fuliginosa* (*impura*)." I noted on my next visit, however, that it was not the same as *fuliginosa*. Having seen nothing else quite like it, I must for the present let it stand as possibly a good species, but feel quite satisfied that nearly all the references of Smith and Dyar to *oxygala* really refer to *minorata*. I have only two specimens from California, which agree with Smith's figure and description of the latter, except that they cannot be called reddish. They certainly might easily be confused with *fuliginosa*, but are not as dark as type *oxygala*, though more uniform smoky than the rest of my series.

In his "Revision of Leucania" Smith claims that the eastern North American form previously known as *pallens* is distinct from that European species, and describes it as *luteopallens* on somewhat indefinite characters, emphasizing, however, a difference in the genitalia. He there includes the Alberta and B. C. races under *minorata*, and says; "It stands between *oxygala* and the European *pallens*, being really the American representative of the latter species." Hampson refers *luteopallens* as a synonym of *pallens*, placing it in a group in the tables, "Fore wing without fuscous shade below median nervure," and holds *minorata* as distinct, and having "fore wing with fuscous shade below median nervure." I could not see that this character held good in the British Museum series, and it seems to be a variable feature all over this continent. The most justifiable separation in the group would seem to be between the European *pallens* and our new world form. In most European specimens the longitudinal strigation is similar, and shading evenly distributed all over the primaries. In none of my specimens is there an obviously darker shade below the median vein, though such a variation is mentioned by Tutt in "British Noctuæ and their Varieties," Vol. I., p. 42, under the name *suffusa*. In American specimens the region of the cell and of the submedian

interspace is frequently somewhat paler than the rest of the wing, and a smoky streak is usual above vein 5. Alberta and California specimens are the darkest in my series, especially as to secondaries, but the variation overlaps, and my most European-like examples are from Vancouver Island. The secondaries vary similarly on both continents, and Mr. G. Chagnon, of Montreal, has exactly duplicated genitalia from both sides of the Atlantic. A pink variation is locally common in England, and it is probable that *rubripallens* Smith will prove to be the corresponding variety with us, but I am not yet sufficiently familiar with this to be able to form a definite opinion.

334, 335. *L. albilinea* Hübn,= *diffusa* Walker.—I have taken specimens here which connect the two series I had previously separated, and agree with Hampson in uniting the names. Walker's type is a female from Nova Scotia. Hampson also includes *obscurior*, *tetera* and *neptis* as synonyms, with which I agree, and would add *limitata* Smith.

336. *L. dia* Grt.= *heterodoxa* Smith.

336a. *L. dia* Grt. var. *megadia* Smith.—I have examined the type of *dia* Grt. in the British Museum, which, according to the catalogue comes from California, and some Calgary specimens are exactly like it. The male and female type *heterodoxa* are from the Sierra Nevada. *Megadia* will stand for that variation with a black basal streak, merely an evanescent character. A Calgary cotype of *megadia* is in the British Museum, and is correctly referred as a synonym of *dia* by Hampson. His reference of *heterodoxa* to *insueta* is based on a Minnesota specimen sent him by Smith. Whether this is the Minnesota example mentioned in Smith's description, of course I cannot be sure. Sir George Hampson's reference of the specimen to *insueta* appears to me correct, though it is unusually pale, and certainly very like some western *dia*. My knowledge of *insueta* is at present rather limited, but those I have from eastern localities suggest dark streaky *dia* with a rufous tinge, and not always a very pronounced one either. I quite expect that *insueta* will ultimately prove to be the same.

337. *L. multilinea* Walker.—I consider this form correctly named. I have a series from Vancouver Island. Besides the Calgary cotype of *anteroclara* Smith, previously referred to, a female

cotype of that from Vancouver, in the Rutgers College collection, is also *multilinea*.

(339. *L. antroclara* Smith.

(340. *L. anteroclara*, var. *calgariana* Smith.—I am convinced of the distinctness of *anteroclara* from *phragmitidicola*, though confusion with that species is certainly easy. *Calgariana* is pretty obviously a reddish variation of *anteroclara*, and bears the same relation to it as *roseola* does to *farcta*. But whether *anteroclara* is really distinct from *farcta* is another matter. *Farcta* was described from California, and I have a good series from Oakland. It is paler and more even, with median vein less contrastingly whitish, and has pure white secondaries. As a rule they may be separated also by the presence of a dark shading below the median vein in *anteroclara*, but this does not always exist. I strongly suspect *anteroclara* of being a dark race of *farcta*, but so closely do species of Leucania sometimes resemble one another that I dare not risk the reference at present. I have very rarely seen true *anteroclara* from west of the Rockies, but have compared and so named a single Kaslo specimen for Mr. Cockle.

*Roseola* was described from a single specimen from B. C., as a variety of *farcta*, but was subsequently treated by its own and all other authors as a species. It is common on Vancouver Island, and also at Kaslo, and occasional specimens, generally females, have dusky shading on secondaries. But without the pink coloration they are *farcta* exactly, and I see no reason for separating them. I have Kaslo specimens, and have compared others, so dark and streaky as to make separation from Calgary specimens of *calgariana* almost impossible, and have so named one for Mr. Cockle, but must for the present allow the names the benefit of the doubt.

341. *Himella contrahens* Walker,= *quadristigma* Smith,= *infidelis* Dyar.—I have six specimens from the Red Deer River, one from Lethbridge, Alta., and others from Regina, Sask., and Cartwright, Man. These show exactly similar variation to a Kaslo series, which are typical *infidelis*. A long series from Stockton and Provo, Utah, are similar, but run to a darker and more suffused form, one of which I have compared with Grote's type of *contrahens* from Nova Scotia, in the British Museum, and believe it to be the same.

Grote mentions after his description that he had found a specimen in the collection of the Canadian Entomological Society labelled "*Celæna contrahens* by Walker. This was presumably Walker's type. I have seen a male and female type of Morrison's *thecata*, from New Hampshire, in the Strecker collection, and they are the same species, as already referred by Smith and others. I do not feel quite sure that *conar* is the same species. It was described from "New Mexico, near the borders of Chihuahua". My notes on the type say that it is "almost flesh-coloured, faintly pink, and not reddish or brown." I have seen nothing else quite like it, and must for the present leave it alone. Hampson's figure under the name *conar* is *contrahens*, or more exactly the paler *infidelis* from Nebraska. The types of *quadristigma*, from Bluff, Utah, and Santa Rita Mts., Ariz., are paler still, and have less of the black suffusion usually found in more northern specimens. I might add that Strecker's description of *conar* says the colour is "very light silky grey, or ashen." Though this could scarcely be translated into "pinkish," as the specimen looked to me, still it is not the way I should describe any *contrahens* in my collection

343. *Tæniocampa malora* Smith,= *hibisci* Guen.—In Vol. XLII., p. 190, June, 1910, I published a note on *hibisci*, pointing out that *alia* was prior to *suffusca*, and citing the B. C. form, previously known as *pacifica*, as a local race of *hibisci* under the new name *latirena*, of which I called *quinquefasciata* a variation. On page 317, (October), Smith admitted the distinctness of *pacifica*, eliminated the name *latirena* as valueless, and made *hibisci* Guen.= *confluens* Morr., and a variety of *instabilis* Fitch. He also reinstated his *quinquefasciata* as a species, and created six more to keep it company, figuring genitalia. Dr. Dyar replied to him on page 399. I have to admit that I erred in producing the name *latirena* rather vaguely, though I thought I made it clear that it was applied to all B. C. forms of *hibisci* hitherto erroneously called *pacifica*. Smith was near the mark in saying that it could only be applied as a synonym of the entire *pacifica* Smith series, with the exception, of course, of *pacifica* Harvey. As Smith then described two variations of the B. C. forms, both of which I consider variations of *hibisci*, to avoid future confusion I refer the first of those names, *inflava*, to *latirena* Dod. His other name, *inherita*, applied to B. C.

specimens signifies a more strigate and irrorate form of the same. What he calls *instabilis* Fitch is, of course, a citation of Fitch of European *instabilis* Schiff,= *incerta* Hübn., which however is not very obviously distinct. *Malora* Smith, described from three males and two females from Calgary, is applied to a dull smoky-grey form of the same species. The variation seems to be very wide wherever the species occurs, though it may be said that, in general, Pacific coast specimens are richer in colour than those from the east, and Alberta specimens intermediate. I can, however, match Calgary and Vancouver specimens almost exactly, and also some from Calgary, Chicago and Montreal. *Quinquefascia'a*, as the name implies, stands for a form with five distinct transverse lines. *Brucei* Smith from Denver, and Garfield Co., Colorado, and *proba* Smith from Alameda Co., Calif., I cannot believe to be distinct from *hibisci*, but *nubilata* Smith may prove distinct. I have a note that I found specimens from that region in Smith's collection suggesting a new species, but failed to make a satisfactory separation. Hampson makes *insciens* Walker, and *confluens* Morr. synonyms of *hibisci*, but calls *hibisci* "ab.I." with the spots joined. This aberration, according to Smith, is also Morrison's *confluens*. Walker's type of *insciens* is a female labelled "U. S. A., (Doubleday)" and has the subterminal line, and annuli to the spots, particularly the orbicular, unusually pale and wide. I have a note to the effect that when I was at the British Museum last March, a specimen labelled *confluens* Morr., the type of *insciens* Walker, and three pale, even, Calgary specimens stood separated in the collection. I fail to see that any such separation is warranted. I also found *latirena* and *pacifica* in the same series under *pacifica*, though I feel satisfied that the latter is distinct.

345. *Cleoceris populi* Strk.—The type of *populi* is from Loveland, Colo., and is a pale, slightly marked thing, and not unlike the form figured in Holland. I have seen Colorado and Wyoming specimens in other collections, but all were paler and less maculate than my Calgary series.

347. *Xylina amanda* Smith.—There are male and female types in the Washington collection, the former from Pullman, Washington, and the latter from Calgary. The Pullman specimen is much paler in colour than the other, and my notes say that they may

possibly be two species. I have specimens from Miniota and Aweme, Man., and Vineyard, Utah, which resemble the Calgary form, and two from Wellington, Vanc. I., are paler, more luteous and less maculate, probably like the Pullman form. The closest ally of this secies is *petulca* Grt., which occurs on Vancouver Island also. *Amanda* is a narrow-winged species, with a rather conspicuous pale yellowish patch in the cell, obscuring the upper portion of the reniform and reaching to the t. p. line. In *petulca*, though the spots themselves are yellowish filled, there is no such patch. Another conspicuous character in *amanda* is that the lower edge of the reniform is, in all my series, filled with dark fulvous. It is probable that I may sometimes, in naming offhand without comparison, have given the name *amanda* to pale specimens of *petulca*. In fact I have suspected them of being variations of one species, but am convinced of their distinctness. I have often seen them mixed in collections. *Amanda* narrowly escaped redescription by its author about two years ago.

348. *X. fagina* Morr.—I have not seen the type of this species, but the Alberta form is the same as the *fagina* of eastern collections. It is very rare here.

349–350. *X. georgii* Grt.—I have taken no more specimens of this species than those I originally listed as *oregonensis* Harvey, and *ancilla* Smith, but after studying material from all over the continent for some years I have long ago come to the conclusion that *oregonensis* and *ancilla* of my list are the same species. I have a specimen from Miniota, Man., compared with the type of *georgii* from Orillia, Ont., in the British Museum, and this scarcely differs from my cotype of *ancilla*. The species is one of the most variable of our Xylinas, the variation consisting in differences in shade of the ground colour, distinctness of maculation, and size and shape of the discoidal spots. Some specimens have slightly brown, almost reddish scales in the reniform, though this is rather unusual. I offer a list of what I consider synonyms of this species, with the type localities of each:

*Oregonensis* Harvey, Oregon.

*Holocinerea* Smith, Winnipeg, Man.; Vancouver, and N.W. British Columbia; Pullman, Washington; Sierra Nevada, Cal.

*Fletcheri* Smith, Ottawa.

*Ancilla* Smith, Calgary; Cartwright, Man; Wellington, B. C. (The male type is from Cartwright, and is practically a dead mate for the male type of *fletcheri*).

*Vertina* Smith, Corvallis, Oregon; B. C.

Var. *emarginata* Smith, Colorado Springs and Glenwood Springs, Colo. A pale, slightly marked form.

The only type of *oregonensis* that I have seen is an Oregon male in the Henry Edwards' collection, and my notes say that it is a pale *holocinerea*. I am in doubt as to the identity of Fig. 26., Plate IV, of Smith's Monograph, and it struck me that the material in his collection under *oregonensis* probably included two species. The *oregonensis* of Hampson's Catalogue, Plate CIII., Fig. 7, is a Californian specimen, and is certainly not *georgii*. I have in my collection a male and two females of a species from Glenwood Springs, Colorado, from Dr. Barnes. One of them is labelled "*oregonensis* Harvey, identified by Smith," and the other is labelled "*torrida* Smith" by Dr. Barnes. In my opinion these specimens are undoubtedly rather poorly marked *antennata*, and agree well with my eastern series of that. Under the description of *torrida*, Smith says that "the more obscure examples remind one of the *antennata* type" and it is possible that the latter species was included in the type material. It will be necessary to re-examine the types to decide, as I have previously mixed the forms myself, but the species I have at present under *torrida* is a brightly marked thing from Vancouver Island, and is that figured by Smith in his monograph under the name, on plate V., fig. 31.

(To be continued.)

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During the latter half of January Mr. F. W. L. Sladen, Assistant Entomologist for Apiculture in the Division of Entomology, Ottawa, has been travelling in Nova Scotia and New Brunswick. A short course in Apiculture was given at the Agricultural College, Truro, and subsequently Mr. Sladen investigated apicultural conditions and possibilities and addressed meetings in the two provinces.

Correction.—P. 367, line 19, after September 12 add 1911, December Number, Canadian Entomologist. F. M. Webster.

# TACHINIDÆ AND SOME CANADIAN HOSTS.

BY J. D. TOTHILL, DIVISION OF ENTOMOLOGY, OTTAWA, ONT.

In working over the Tachinidæ in the collection of the Division of Entomology, at Ottawa, a number of breeding records were encountered. Thirty-nine of these are new, in so far as the writer is aware, and these form the basis of the present list. In addition to these thirty-nine, there are seven that have been published since the appearance of Coquillett's "Revision of the Tachinidæ of America, north of Mexico," and Aldrich's "Catalogue of North America Diptera." These seven are included in the present list; they are indicated by an asterisk (*), and reference is made in each case to the published record.

The majority of these records were obtained by Dr. James Fletcher and Mr. Arthur Gibson. To the latter colleague, whose kindly assistance has made possible the compilation of the present list, the writer is under numerous obligations. The letters J. F. or A. G. placed in brackets after the species indicate the person who was responsible for the rearing. A few records were obtained by others than the above; in these cases the names or initials of the persons responsible for the rearing are given.

No doubtful records are included in the list. The arrangement follows that of Mr. D. W. Coquillett in the excellent list of tachinid flies and their hosts contained in his "Revision" (loc. cit., p. 9).

| PARASITES. | HOST INSECTS. |
|---|---|
| *Blepharipeza adusta* Loew..... | *Halisidota caryæ* Harris.—Bred from cocoons of host collected at Ottawa; 11 specimens, issued June 16–July 4. (A. G.) |
| | *Halisidota maculata* Harris.—Bred from cocoons of host collected at Ottawa; 1 specimen. (A. G.) |
| | *Malacosoma disstria* Hubn.—Bred at Fredericton, N. B., from larvæ and pupæ collected locally and at Ottawa; numer- |

ous specimens, issued spring. (J. D. T.)

*Blepharipeza leucophrys* Wied.... *Sphinx chersis* Hbn.—Bred from specimen of pupa collected at Ottawa; 1 specimen, issued May 30. (A. G.)

*Euphorocera claripennis* Macq.... *Heliophila unipuncta* Haw.—Bred from larva collected at Ottawa; 1 specimen. (J. F.)

*Malacosoma* sp.—Bred at Ottawa from larva; place of collection not known. (J. F.)

*Exorista affinis* Fall..... *Phragmatobia fuliginosa* Linn.—Bred from cocoons collected at Ottawa; 2 specimens, issued April 13 and 27. (A. G.)

*Exorista cheloniæ* Rond..... *Apantesis ornata* Pack., var. *achaia* G. & R.—Bred at Ottawa from larvæ collected at Kaslo, B. C.; 3 specimens, issued June 6. (A. G.)

*Malacosoma disstria* Hbn.—Bred at Fredericton, N. B., from larvæ collected locally and at Ottawa; numerous specimens, issued spring. (J. D. T.)

**Phragmatobia assimilans* Walk., var. *franconia* Slosson.—Bred at Ottawa from larvæ collected at Hymers, Ont,; 1 specimen, issued May 7; c.f. A. Gibson, Ent. Record, 1910, p. 18, and A. Gibson, CAN. ENT., Vol. XLIII., p. 127.

*Exorista eudryæ* Town..... *Euthisanotia grata* Fab.—Bred from larva collected at Ottawa; 1 specimen, issued Aug. 27. (J. F.)

*Exorista futilis* O. S.....*Isia isabella* S. & A.—Bred from larva collected at Ottawa; 1 specimen, issued May 21. (J. F.)

*Hyppa xylinoides* Gn. — Bred from larva collected at Ottawa; 1 specimen, issued May 23. (C. H. Young.)

*Exorista helvina* Coq.....*Lycia cognataria* Gn.—Bred at Ottawa from larvæ collected at Coldstream, B. C.; 4 specimens, issued May 29 and June 12. (A. G.)

*Exorista nigripalpis* Town.....*Tortrix fumiferana* Clem.—Bred by G. E. Sanders at Ottawa from larvæ collected at Chicoutimi, St. Sylvestre and Maniwaki, P. Q., and Duncans, B. C.; 68 specimens, issued June 18–July 10.

*Exorista pyste* Walk.....*Tortrix fumiferana* Clem.—Bred at Ottawa by G. E. Sanders from larvæ collected at Chicoutimi, P. Q.; 2 specimens, issued July 3.

*Exorista vulgaris* Fall.....*Tortrix fumiferana* Clem.—Bred at Ottawa by G. E. Sanders from larvæ collected at Chicoutimi, St. Sylvestre, St. Gabriel de Brandon and Montcalm, P. Q.; 16 specimens, issued June 18–July 10.

*Frontina frenchii* Will.....*Papilio daunus* Bdv.—Bred at Ottawa from pupæ collected at Kelowna, B. C.; 9 specimens, issued Aug. 23. (A. G.)

*Papilio eurymedon* Bdv.—Bred at Ottawa from pupæ collected

at Nanaimo, B. C.; 10 specimens, issued April 12, 16, 17 and 19. (A. G.)

*Samia columbia* Smith.—Bred at Ottawa from pupæ collected at Cartwright, Man.; 7 specimens. (J. F.)

*Frontina tenthredinidarum* Town. . *Cladius pectinicornis* Fourc.—Bred from larva collected at Ottawa; 1 specimen, issued Aug. 29. (J. F.)

*Emphytus canadensis* Kirby.—Bred from larva collected at Ottawa; 1 specimen, issued Sept. 1. (J. F.)

**Nematus erichsonii* Hartig.—Bred from cocoons collected at St. John, N. B.; c.f. C. G. Hewitt, "The Larch Sawfly," Bull. No. 5, Div. of Ent., Ottawa.

*Gonia capitata* DeG. . . . . *Paragrotis ochrogaster* Gn.—Bred at Ottawa from pupæ collected at Cow Bay, C. B.; 1 specimen. (J. F.)

Agrotid sp.—Bred from pupa collected at Ottawa; 1 specimen, issued spring. (J. F.)

*Linnæmyia anthracina* Thompson. **Hyphoraia parthenos* Harris.—Bred at Ottawa from larvæ collected at Hymers, Ont.; 2 specimens, issued May 16; c.f. W. R. Thompson, CAN. ENT., Vol. XLIII., No. 8, p. 266.

*Masicera eufitchiæ* Town. . . . . *Halisidota tessellaris* S. & A.—Bred from pupæ collected at Ottawa; 2 specimens, issued Aug. 8. (A. G.)

*Masicera myoidea* Desv. ..... **Papaipema appassionata* Harvey.—Bred at Ottawa from larva collected by C. H. Young, at Meach Lake, P. Q.; 1 specimen, issued Aug. 13; c.f. James Fletcher, Ent. Rec. 1906, p. 102.

*Papaipema purpurifascia* G. & R.—Bred from larvæ collected at Ottawa; 9 specimens, issued Aug. 24–28. (A. G.)

*Masicera rutila* Meig. ..... *Tortrix fumiferana* Clem.—Bred at Ottawa by G. E. Sanders from pupæ collected at Duncans, B. C.; 2 specimens, issued July 10 and 19.

*Phorichæta sequax* Will. ..... *Heliophila commoides* Gn.—Bred from specimens of host collected at Ottawa; 7 specimens, issued June 10. (A. G.)

*Phorocera leucaniæ* Coq. ..... **Euproctis chrysorrhœa* Linn.—Bred at Fredericton, N. B., from larva collected by P. N. Vroom at Chamcook, N. B.; 1 specimen, issued spring. A valuable parasite of the same host in Massachusetts; c.f. Fiske & Howard, Bull. 91, Bureau of Ent., U. S. Dept. of Agr., Washington, D. C. (J. D. T.)

*Phorocera saundersii* Will. ..... *Ennomos magnarius* Gn.—Bred at Ottawa from pupa collected at Mt. Hebron, N. B.; 1 specimen, issued in office, Dec. 31. (J. F.)

*Euvanessa antiopa* Linn.—Bred

from pupa collected at Ottawa; 1 specimen. (J. F.)

*Plagia americana* V. d W.....*Plusia æreoides* Grt.—Bred from larvæ collected at Ottawa; 2 specimens, issued June 10. (A. G.)

*Sturmia albifrons* Walk.....*Heliophila unipuncta* Haw.—Bred from larvæ collected at Ottawa; 4 specimens, issued July 8. (J. F.)

*Sturmia inquinata* V. d W.....*Sphinx chersis* Hbn.—Bred from larvæ collected at Ottawa; 20 specimens, issued May 22. (A. G.)

*Sturmia normula* V. d W.....*Lemonias taylori* Edw.—Bred at Ottawa from larva collected on Vancouver Island; 1 specimen. (J. F.)

*Sturmia phyciodis* Coq.....*Phyciodes tharos* Drury.—Bred from specimen of host collected at Ottawa; 1 specimen, issued June 23. (J. F.)

*Tachina mella* Walk.....*Datana ministra* Drury.—Bred at Ottawa from larvæ collected at Armstrong, B. C.; 2 specimens, issued in office, Oct. 29. (A. G.)

*Notolophus antiqua* Linn.—Bred at Ottawa from larvæ collected at Rudolph, N. S.; 5 specimens, issued Sept. 3. (A. G.)

*Tachina simulans* Meig.....*Harpiphorus tarsatus* Say.—Bred from specimen of host collected at Ottawa; 1 specimen, issued June 30. (J. F.)

*Winthemia fumiferanæ* Tothill....**Tortrix fumiferana* Clem. — Bred at Ottawa by G. E.

Sanders, from Maniwaki, Que., and Duncans, B. C.; 26 specimens; c.f. J. D. Tothill, CAN. ENT., Vol. XLIV., No. 1, p. 2.

*Winthemia quadripustulata* Fab. . . *Cucullia convexipennis* G. & R. —Bred from larva collected at Ottawa; 1 specimen. (J. F.)

**Marumba modesta* Harris.—Bred from larva; c.f. James Fletcher, Ent. Record, 1903, p. 99.

*Pholus achemon* Drury.—Bred from pupa collected at Ottawa; 1 specimen. (A. G.)

The specimens reared from the above three hosts issued May 11, 16 and Sept. 21.

## GEOMETRID NOTES—NEW VARIETIES

BY L. W. SWETT, BOSTON, MASS.

*Cleora pampinaria* var. *nubiferaria*, n. var.

Expanse 29 mm.; palpi very short. Fore wings smoky black with line running from inner margin up to vein 1, then along the vein for about 3 mm., where it stops. In the centre of the fore wings on the median vein there is a dark line, especially broad at the vein, where it curves upward at right angles to the costa. On the outer fourth there is another band parallel to this, which runs from the median vein to costa just beyond the faint black discal spot. These lines are practically the same as in normal *pampinaria* but the black colourings of the wings render them indistinct. There is a very distinct white zig-zag line running parallel to the outer margin from costa to inner margin with a long white projection near $M_2$. The fringe is quite long and black with points at base. The hind wings are of the same smoky colour as the fore wings, with a faint extra-discal black line, which shows as black points on the veins. The discal spot appears as a ring and touches the extra-discal line. There is a trace of an irregular white line near outer margin. The outer edge of the wing is slightly

scalloped and the fringe is rather long. Beneath the fore wings are smoky black with discal spot showing through; the apices of the wings are tipped with white. Hind wings of the same colour as fore wings with black discal spot instead of ring as above.

Type 1 ♂, Cincinnati, Ohio; through the kindness of Miss A. F. Braun.

This is no doubt a case of melanism and was so identified for me by Mr. Grossbeck. Melanism seems to be rare in this country but is common in Europe where it seems to represent a more recent type.

*Ania limbaria* var. *chagnoni*, n. var.

Expanse 22 mm.; palpi very short. Fore wings bluish yellow with chocolate border, basal space and mesial space of the same colour up to the chocolate-coloured margin. The basal line about 4 mm. out from body runs at right angles from costa to median vein, then almost straight to inner margin. There are traces of a large lunule near where the discal spot would be and expanding to the extra-discal line. Beyond the extra-discal line the entire margin is chocolate-coloured. Hind wings bluish yellow to the extra-discal line, beyond the margin chocolate as in fore wings. There is a large lunule in the discal space. Fore wings of the same colour as above, the chocolate margin showing through. The hind wings are the same as above, bluish yellow with a chocolate margin. This seeems to be a case of melanism but the markings are not identical with *limbaria*. Possibly this is a northern species. It is so different in appearance from *limbaria* that one would hardly recognize it, or where it belonged, were it not for the peculiar spur of the hind tibiae.

Type 1 ♂, St. Therese Isle, St. Johns Co., Que., VII.–9–1912; through the kindness of Mr. G. Chagnon, after whom I take pleasure in naming this unique variety.

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Mr. Frederick Knab, of the U. S. Bureau of Entomology, has been recently appointed Honorary Custodian of the Diptera in the U. S. National Museum, to succeeed the late Mr. D. W. Coquillett.

## THE SPRING GRAIN APHIS OR "GREEN BUG."

This aphis *Toxoptera graminum* Rond., must not be confused with the wide-spread grain aphis *Macrosiphum granaria* Buckton, formerly known as *Siphonophora avenæ* Fab., which is destructive from time to time in Canada. *Toxoptera graminum* has been found in western Canada, but it has not as yet inflicted depredations of so serious a character as have been recorded from time to time since 1890 in the United States. The very destructive nature of the "Green Bug," as it is popularly termed, in the United States in 1907, in which year it was also recorded in Manitoba and Saskatchewan, led the United States Congress to make a special appropriation for its investigation. These investigations have been continued up to the end of 1911 and the Bureau of Entomology of the United States Department of Agriculture have now published a record of the entire investigation by F. M. Webster and his assistant, W. T. Phillips (Bull. No. 110, Bur. Ent., U. S. Dept. Agric., Washington, 153 pp., 48 figs., 9 pls., 1912).

It is not possible within the compass of a short article to refer in more than a brief manner to the varied and valuable results of this study. The study is of unusual interest in that it affords results of value not only to the economic worker but also to the embryologist and to the student of insect bionomics, all of which results are necessary to a complete interpretation of this remarkable insect's habits and depredations.

South of the 35th parallel it appears to be permanently viviparous and to breed without the appearance of the sexes. It is unable to survive hot and dry conditions in the Southern States. In Indiana the overwintered eggs hatch from the end of March to about April 10th giving rise to wingless stem-mothers which pass through five instars. These stem-mothers reproduce viviparously producing wingless viviparous females and winged viviparous females.

The great fecundity of the aphids, due to their viviparous habits, is well known and the results of the authors' study of the progeny of single lines are of great interest in this connection. In Indiana the eggs hatched on March 27th, and the first-born aphids produced twenty-one generations before the adult ovipositing females appeared in November; the last born females produced ten

generations. In Texas there were twenty-five generations between March 31st. and November 3rd. The age at which the females begin to reproduce varies according to the season; early in the season it is from twenty to twenty-seven days, from May to September it is from about six to sixteen days and later in the season from twelve to fifty-three days, the average for the three seasons of the year being early spring twenty-two days, summer nine days, and early fall nineteen days. In Texas the time is shorter, the shortest time being six days. The reproductive period is longer in the average in the spring and fall than in the summer; in the spring the average is eighteen days, in the summer twenty-six days and in the fall, forty-five days. The longest likewise is greater in the spring and fall than in the summer, the average is thirty-five days and the longest is seventy-eight days. The rapidity of production it very great: in Indiana the greatest number of young produced by one female in twenty-four hours was eight, in Texas ten. The greatest number of young produced by one individual was ninety-three. The average number of young for the entire viviparous breeding season, over a period of three years (1907-9), was 28.2; the average number of young produced in a day is greatest in the Spring.

The sexual forms, male and female, appear in Indiana at the end of September and adults may be found from October until the cold kills them off in December.* The oviparous females become adult in 11 to 41 days according to weather conditions, and if males are present they oviposit in from three to nine days. The males live from 8 to 10 days after reaching maturity, the females from 31 to 68 days if males are present; if males are not present they can live 88 days after reaching maturity. Aberrant individuals were found containing both living embryos and true eggs.

Throughout the Northern United States and no doubt in

* On page 77 the author states "one agamic female may reproduce all agamic individuals, a combination of agamic males and oviparous females or only true females and males." What are "agamic males"? An agamic female we know is a female which produces young in a parthenogenetic manner, that is, without fertilisation by the male. Huxley was the first, I beleive, to use the term "agamic" for this form of reproduction in the Aphids. As the male aphid, fortunately, cannot give birth to young either sexually or asexually is it not misusing the word to apply it to the male?

Canada also, Blue grass (*Poa pratensis*) is the most common host of Toxoptera.

The diffusion or natural spread of the Green Bug is dependent upon a number of factors both meteorological and biological. For example the influence of wind in dispersion depends upon whether the insect is in a winged or apterous condition and this is, of course, dependent upon those factors producing these conditions such as the curtailing of food supply, etc. The most favourable conditions for natural diffusion appear to be a decreasing food supply with a fairly high temperature and a not excessive parasitism.

The effects of temperature varied according to the locality whether in a north or southern region. In the north, where the effects of the temperature concern us most, the insect winters in the egg state. Here warm winters are of less importance and cool weather during spring and early summer exert a far greater influence on the numerical abundance of the insect.

As the early developmental stages in the winter eggs are effected by the temperature a complete study of the biology of *Toxoptera* necessitated the study of the embryology. The results of this study and the figures of the embryonic stages which are given are a welcome addition to our knowledge of insect embryology, the observations on that peculiar embryonic structure which the present authors have termed the "polar organ" being of special interest. The general results of their study, however, does not materially affect the early observations of Witlaczil, Will and others and the more recent work of Tannreuther.

The study of the natural enemies of the Green Bug naturally forms one of the most important sections of the work. The efforts made in certain quarters in the direction of distributing the chief parasite *Aphidius testaceipes* Cresson (known also by a host of other synonyms under the genus *Lysiphlebus*) and the reported success of these efforts made it extremely desirable that the biology and distribution of this parasite should be carefully studied and this fact is especially borne out by the results of the present thorough study of *Aphidius*, its biology and its relation to meteorological conditions in Kansas and other States. It was found that not only did this parasite occur over almost the entire United

States but that it would breed interchangeably from *Toxoptera* into other species of Aphids and in addition was reared from a large number of common and widespread species of Apids. Taking these facts into consideration it is very easy to see, as the authors rightly point out, "that it would be only in rare instances and under peculiar conditions that a locality would be found where *Aphidius testaceipes* would not be lurking, waiting for favourable weather conditions and abundant supplies of its host aphids to make its appearance in greater or less numbers." The effectiveness of this parasite will be appreciated when it is realized that a single female *Aphidius* may parasitize no less than 301 *Toxoptera*. No wonder their natural control is, at times, so sweepingly effective! Regarding the artificial distribution of the parasites, these investigations naturally point to the "futility of attempting materially to increase its numbers or efficiency by artificial introduction into grain fields" and further, I would add, they point to the necessity of making as careful studies as possible of the parasites before adopting any extensive system of artificial distribution. The account of the remedial and preventive measures is prefaced by the statement that with "an outbreak of this pest fully established and the winged adults being carried by the wind and scattered over the fields there to settle down and reproduce, the difficulties in the way of control are quite insurmountable." Bush-drag experiments, and spraying did not give satisfactory results or were impracticable. Cultural methods of prevention are the most important and the chief of these is the destruction of volunteer grain. In this connection I would venture to suggest, would it not be well to leave the volunteer growth as a trap crop, then seed later or sow spring oats? In the north the close grazing of waste lands is recommended; this would result in the destruction of a considerable proportion of the eggs laid on the Blue grass (*Poa pratensis*) which appears to be the normal host of the Green Bug in northern localities.

Great credit is due to Mr. F. M. Webster and his very able assistants, particularly Mr. Phillips, for the thorough character of this investigation, the results of which will be of great assistance to others working in the same field and confronted with similar problems.

C. Gordon Hewitt.

# GENERIC TABLES FOR THE CIMICID SUBFAMILIES PHYLLOCEPHALINÆ, PHLŒINÆ AND DINIDORINÆ.

*BY THE LATE GEORGE W. KIRKALDY.

## TABLE OF GENERA OF PHYLLOCEPHALINÆ.

1 (34) Pronotum rounded laterally, or if produced, then the produced part does not extend apically as far as the eyes.

2 (19) Lateral angles of pronotum obtuse or rounded, or if acute, then scarcely prominent.
(For *Delocephalus* No. 19.)

3 (18) Interoanterior angles of pronotum not produced.

4 (17) Hind angles of pronotum near the scutellum, not angulate.

5 (16) Lateral margins of pronotum not prominent anteriorly.

6 ( 9) Head short, scarcely longer than its breadth between the eyes, if at all.

7 ( 8) Costal margin of corium not lævigate, unless anteriorly, or rather sparsely punctured.....5. *Metonymia* Kirk.

8 ( 7) Costal margin of corium entirely pale, lævigate, sometimes marked with spots or transverse impressions or black points, in remote transverse series.....6. *Dalsira*† A. & S.

9 ( 6) Head distinctly longer than its breadth between the eyes.

10 (15) Antennæ extending apically as far as the apex of the head.

11 (12) Lateral margins of head laterally not or scarcely converging towards the apex, till close to it.....16. *Phyllocephala* Laporte

12 (11) Lateral margins of head distinctly converging to the apex.

13 (14) Lateral lobes of head plane or somewhat concave.....10. *Schyzops* Spinola.

14 (13) Lateral margins of head convex....14. *Dichelorhinus* Stal.

15 (10) Antennæ not extending as far as apex of head.....15. *Randolotus* Distant.

*These three tables are a beginning of the numerous uncompleted papers left by my late friend, which I purpose to publish from time to time, as I am able to edit them and tie up loose ends, if such there be. Fragments though these be, they will, nevertheless, prove highly useful in the absence of any late general work on these subfamilies.—J. R. T. B.

† 22. *Frisimelica* Distant seems to be near here, but the description is defective.

16 ( 5) Lateral margins of pronotum prominent anteriorly.....24. *Delocephalus* Distant.

17 ( 4) Hind angles of pronotum acutangular near the scutellum.....23. *Megarrhamphus* Bergr.

18 ( 3) Interoanterior angles of pronotum produced, or at least strongly dentate.....3. *Lobopeltista* Schout.

19 ( 2) Lateral angles of pronotum strongly acute or very prominent.

20 (27) Lateral angles of pronotum not turned forward.

21 (24) Lateral lobes of head contiguous in front of the median lobe.

22 (23) Anterolateral margins of pronotum straight.....7. *Mercatus* Distant.

23 (22) Anterolateral margins of pronotum sinuate.....9. *Schismatops* Dallas.

24 (21) Lateral lobes not contiguous, unless at the base.

25 (26) Interolateral margins of lateral lobes as long as from apex of median lobe to base; lateral angles of pronotum acuminate.....18. *Diplorhinus* A. & S.

26 (25) Interolateral margin very short in front of median lobe; lateral angles of pronotum acute.4. *Storthogaster* Karsch.

27 (20) Lateral angles of pronotum turned more or less forward.

28 (29) Lateral angles of pronotum prominent, but apically blunt.....8. *Sandehana* Distant.

29 (28) Lateral angles of pronotum acute.

30 (33) Anterolateral margins of pronotum slightly sinuate.

31 (32) Antennæ longer, second joint reaching or scarcely exceeding apex of head; lateral angles of pronotum produced.....12. *Gonopsis* A. & S.

32 (31) Antennæ shorter, second joint scarcely reaching apex of head; lateral angles of pronotum rounded, scarcely prominent.....13. *Kaffraria* Kirk.

33 (30) Anterolateral margins of pronotum deeply emarginate.....19. *Macrina* A. & S.

34 ( 1) Pronotum with lateral angles prominently extending forwards very distinctly beyond the eyes.

35 (44) First segment of antennæ not reaching to apex of head.
36 (41) Lateral margins of pronotum not extending as far as apex of median lobe of head.
37 (38) Lateral lobes of head contiguous....11. *Salvianus* Distant.
38 (37) Lateral lobes of head not contiguous, except at base.
39 (40) Anterolateral angles of pronotum acutely prominent.....17. *Roeburnea* Schout.
40 (39) Lateral angles of pronotum acuminately prominent.....22. *Melampodius* Schout.
41 (36) Lateral angles of pronotum extending as far as the apex of the median lobe of the head.
42 (39) Lateral lobes of head acutely produced.20. *Tetroda* A. & S.
43 (42) Lateral lobes of head exteriorly rounded...21. *Gellia* Stal.
44 (35) First segment of antennæ extending beyond apex of head.....1. *Cressona* Stal.

TABLE OF GENERA OF PHLŒINÆ.

1 ( 4) Antennæ inserted close to the eyes (*Neogeic*).
2 ( 3) Scutellum as long as the space from its hind angles to the base of the laminate portion of the abdominal apex, distinctly shorter than the corium; lateral lobes of the head contiguous or overlapping...1. *Phlœa* Lep. & Serv.
3 ( 2) Scutellum more than twice as long as the space between the hind angles and the basal part of the laminate apex of the abdomen, very slightly shorter than the corium; lateral lobes of the head contiguous only basally in the middle.....2. *Phlœophana* Kirkaldy.
4 ( 1) Antennæ inserted above one-third from apex of the head (*Palæogeic*).....3. *Serbana* Distant.
The fossil *Palæophlœa* is not included.

TABLE OF GENERA OF THE SUBFAMILY DINIDORINÆ.

1 (16) Lateral margins of abdomen not tuberculately dentate.
2 (15) Pronotum anteriorly not wider than the head with eyes; pronotum laterally sometimes marginate, never laminate.
3 (12) Tarsi 3-segmentate.
4 ( 9) Antennæ 4-segmentate.

5 ( 8) Lateral lobes of head either not longer than the median, or, if so, then contiguous, at least partly.
6 ( 7) Labium scarcely extending to middle coxæ; hind femora not widened at base. . . . . 1. *Cyclopelta* A. & S.
7 ( 6) Labium extending to hind coxæ; hind femora (at least in ♀) strongly widened at base. . 2. *Patanocnema* Karsch.
8 ( 5) Lateral lobes of head much longer than the median, and not at all contiguous . . . . . 3. *Dinidor* Latr.
9 ( 4) Antennæ 5-segmentate.
10 (11) Head subæquilateral, or scarcely transverse, lateral margins straight or slightly sinuate; eyes sessile; ♂ pygophor not emarginate, apically rounded, rarely with an obsolescent sinuation in the middle. . 4. *Aspongopus* Laporte.
11 (10) Head transverse, deeply sinuate in front of the stylate eyes; fore femora distinctly spinose towards the apex; ♂ pygophor distinctly sinuate apically . 5. *Colpoproctus* Stal.
12 ( 3) Tarsi 2-segmentate.
13 (14) Lateral margins of head not contiguous, head laterally with a spine in front of the eyes. . . . 6. *Thalma* Walker.
14 (13) Lateral lobes of head contiguous, head spineless in front of the eyes. . . . . 7. *Urusa* Walker.
15 ( 2) Pronotum anteriorly much wider than the head with eyes; pronotum laterally distinctly laminate. 8. *Sagriva* Spinola.
16 ( 1) Lateral margins of abdomen tuberculately dentate.
17 (18) Lateral margins of pronotum obliquely straight . . . . . 9. *Byrsodepsus* Stal.
18 (17) Lateral margins of pronotum angularly sinuate. . . . . 10. *Megymenum* Laporte.

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The Province of Quebec is to be congratulated on its decision to appoint a Provincial Entomologist. The Rev. Abbe V. A. Huard, the Conservator of the Provincial Museum at Quebec, has been appointed to the office of Entomologist. As the editor of "Le Naturaliste Canadien" and successor to Provancher, he is well known to entomologists in Canada, and we wish him all success in his new duties in a field which offers unparalleled opportunities for entomological work and assistance to those whose livelihood depends on successful husbandry in the farm, field and forest.

## SOME TROPIC REACTIONS OF *MEGILLA MACULATA* DE G. AND NOTES ON THE HYDROTROPISM OF CERTAIN MOSQUITOES.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

This ladybird, which is the only species in New Jersey hibernating in sufficient numbers to be considered a colony, lends itself readily to experimentation, and the colonies containing as a rule about a thousand individuals may be found in different localities usually under a piece of bark or a mass of dried leaves.

This colonial hibernation is the result of various reactions to tropic stimuli. First the question arises as to just why they congregate in large numbers and this may be explained by chemotropism. All Coccinellidæ emit peculiar odors and as the colony increases, so does the odor, thereby making the chemotropic stimuli stronger and more effective. Mr. Edward K. Carnes in bulletin No. 5, Vol. I, of the California State Commission of Horticulture, writes that he has located colonies of *Hippodamia convergens* in that state simply by the odor alone. Here, however, the individuals in a colony number two and a half millions or more.

A lowering of the temperature as winter approaches with a corresponding decrease in the food supply undoubtedly renders them exceedingly susceptible to chemotropic stimuli. With *Megilla maculata*, there is no evidence at present that anemotropism plays any part in the selection of the hibernating quarter. Once in their place of hibernation, they become positively thigmotropic and negatively phototropic. Two hundred individuals were removed from a colony and placed in a glass breeding cage, one end of which was constructed so that they could if they desired act positively photo- and thigmotropic and the other end so that they could act only negatively phototropic and positively thigmotropic. Every one selected the dark end. This happened on both sunshiny and cloudy days. During all operations the temperature of the entire cage was uniform as indicated by thermometric tests. During the above experiment the temperature was gradually lowered in eight hours from 70° F. to 36° F.

At a temperature of 54° F. they remained as before. At a temperature of 64° F. about one third became positively phototropic and negatively geotropic, and their activity undoubtedly

made them susceptible to chemotropic stimuli from a food viewpoint.

At a temperature of 70° F, about one-half were active and at 75° F. all were active. When the temperature was suddenly lowered as from 75° to 36° F. all became dormant at once and exhibited no tropic reactions. By at once I mean within ten or twelve minutes. Without doubt thermotropism plays an important if not the most important part in deciding just what reactions are to occur. A gradual lowering of the temperature such as would naturally result in the beetles acting phototropically and thigmotropically while a sudden drop resulted in what might be called immediate partial hibernation. Of course with a soft bodied insect this would have resulted in death. When the temperature of the air was 42° F., that of their natural hibernation place was 54° F. which indicates an effort to secure optimum conditions.

After emerging from winter quarters, the females of *Culex pipiens* are at first positively chemotrophic. After having fed they become positively hydrotropic and deposit their eggs on the surface of water. While in hibernation during which time they may be fairly active, depending on the temperature of their hibernation quarters, they are strongly negatively hydrotropic. Food and water placed within easy reach of hibernating specimens were always avoided, even when the temperature of their surroundings was 75° or 80° F.

*Aedes sollicitans* and *Aedes cantator* are also positively hydrotropic but not to the extent of most other mosquitoes. With these species eggs are deposited in damp depressions and not on the surface of the water. Sterile females of both of these species are strongly negatively hydrotropic and fly long distances away from salt marshes where they breed. However this migratory habit, or at least the direction they take, is undoubtedly influenced by anemotropism inasmuch as they allow themselves to be carried by strong breezes and will fly inward against light breezes. Sterile females of *Aedes tæniorhynchus*, which has a similar life history to *sollicitans* are to a certain extent negatively hydrotropic.

*Aedes salinarius*, another salt marsh form is as strongly positively hydrotropic as *Culex pipiens*, in fact its hydrotropic reactions are similar to those of *pipiens*, as is its life history.

At different periods during a mosquito's life, its hydrotropic reactions are overshadowed by responses to chemotropic and phototropic stimuli and in some cases, negative hydrotropism might be mistaken for positive chemotropism. In the cases of the sterile females of *Aedes sollicitans*, chemotropism plays very little if any part in explaining their migratory habit. If it did the migrations would not be so extensive or cover the long distances they do.

Negative hydrotropism seems to be more prevalent among the salt marsh than other forms, in fact other species are negatively hydrotropic only for short periods and the females responding to such stimuli are not barren. For some reason the sterility of *sollicitans* seems to render it exceedingly susceptible to negative hydrotropic stimuli.

## ANNUAL MEETING OF THE BRITISH COLUMBIA BRANCH.

The annual meeting of the British Columbia Entomological Society took place on January 9th, 1913, in Victoria. A morning, afternoon and evening programme was arranged. From 18 to 27 members were present during the day. A varied programme was rendered which included several reports from districts in the Province, viz., the Victoria District, the Lower Mainland, the Okanagan and the Kootenay.

An interesting lecture was given on the use of Carbon Bisulphide as a fumigant under coastal conditions by Mr. W. H. Lyne, Assistant Inspector of Fruit Pests. Mr. W. H. Brittain followed with a paper prepared on the important subject of Beneficial Insects, bringing the notice of the members forcibly to the fact that applied parasitic entomology was well to the forefront of present day economic entomology. He gave a number of interesting records which had taken place during the past few years in this especial connection.

Mr. G. O. Day, F. E. S., Duncans, presented a paper on *Xanthia pulchella* Smith, and offered a few systematic notes on its

life history. Mr. R. C. Treherne gave the members present a brief outline of the life history of the Strawberry Root Weevil (*Otiorhynchus ovatus*), illustrating his points by means of diagrammatic charts.

Mr. Thomas Cunningham gave a long and very interesting paper on the strides that had taken place in the United States and in the world in general in regard to the placing of quarantine measures against injurious insects liable to importation through the medium of trade. His memorandum was listened to with great interest as it contained a summary of all the acts and regulations that had been passed during the past few years, and the reasons for the consideration of these acts and regulations and followed his paper with an outline of the insects at present in B. C., and drew attention to the ones liable to importation.

Mr. Tom Wilson, President, 1912-1913, offered his Presidential Address to the members at the evening session. He drew the attention of the members to the establishment of an investigational station under the Dominion Division of Entomology, a fact that will in all probability be accomplished by the spring. He also desired to welcome Mr. Brittain, the recently appointed Entomologist and Plant Pathologist to the Province under the auspices of the Provincial Department of Agriculture. He added his own sorrow to the resolution of commiseration at the recent death of their late President and father of their Society, the Rev. G. W. Taylor of Departure Bay, Vancouver Island. He closed with a feeling of congratulation at the successful resuscitation of the Society and hoped it would continue as successful as this meeting promised in the future,

Mr. Arthur H. Bush followed with an account of the Flora and Fauna that was common to meet with in the mountains at high and arctic elevations. He closed with a wish that the Society not forget the systematic side of entomology in its endeavours to become a force in the Province. Dr. Seymour Hadwen closed the evening session with a lantern slide lecture on Blood-sucking Flies. He was able to establish the fact of the existence at Agassiz of the English Warble fly (*Hypoderma bovis*,) which previously had not been recorded as existing on the North American continent.

Various resolutions were passed, chief among which was a tribute to the life and work of the late Dr. Fletcher. It was decided also to hold a semi-annual meeting of the Society at Vernon during June.

The following officers were appointed for the year 1913;—Hon. President, E. Baynes Reed; President, G. O. Day, F. E. S.; Vice-president, R. S. Sherman ; Secretary, R. C. Treherne; Asst. Secretary, W. H. Brittain. Advisory Board.—G. O. Day, R. S. Sherman, R. C. Treherne, W. H. Brittain, W. H. Lyne, A. H. Bush, Tom Wilson.

The proceedings of the Annual meetings are duly being printed at the cost of 25 cents each copy and can be had on application to the Secretary, Mr. R. C. Treherne, 1625 Nelson Street, Vancouver, B. C. R. C. TREHERNE, SEC.-TREAS.

## ENTOMOLOGICAL SOCIETY OF AMERICA.

The seventh annual meeting of the Entomogical Society of America was held in the Normal School, Cleveland, Ohio, December 31, 1912, January 1, 1913. The meetings were all large and enthusiastically attended.

The following list of papers was presented:

C. Betten.—An interesting feature in the venation of *Helicopsyche*, the Mollannidæ, and the Leptoceridæ,

T. J. Headles.—Some facts regarding the influence of temperature and moisture changes on the rate of insect metabolism.

Lucy Wright Smith.—Mating and egg-laying habits of *Perla immarginata* Say,

Alvah Peterson.—Head and mouth-parts of *Cephalothrips yuccæ*.

J. E. Wodsedalek.—Life history and habits of *Trogoderma tarsale*, a museum pest.

Leonard Haseman.—Life cycle and development of the Tarnished Plant-bug, *Lygus pratensis* Linn.

J. F. Abbot.—The strigil in Corixidæ and its probable function.

Victor E. Shelford.—The ontogeny of elytral pigmentation in *Cicindela*.

N. L. Partridge.—The tracheation of the pupal wings of some saturnians.

L. B. Walton.—Studies on the mouth-parts of *Rhyparobia maderiæ* (Blattidæ), with a consideration of the homologies existing between the appendages of the Hexapoda.

James Zetek.—Determining the flight of mosquitoes.

William A. Riley.—Some sources of laboratory material for work on the relation of insects to disease.

Y. H. Tsou and S. B. Fracker.—The homology of the body setas of lepidopterous larvæ.

Anna H. Morgan.—Eggs and egg-laying in may-flies.

Herbert Osborn.—Remarks on the Cicadidæ with special reference to the Ohio Species. 2. Notes on insects of a lake beach.

Edna Mosher.—The anatomy of some lepidopterous pupæ.

Frank E. Lutz.—On the biology of *Drosophila ampelophila*.

E. P. Felt.—Observations on the biology of a blow-fly and a flesh-fly.

C. K. Brain.—Some anatomical studies of *Stomoxys calcitrans* Linn.

Edith M. Patch and William C. Woods.—A study in antennal variation.

Alex. D. MacGillivray.—Propharynx and hypopharynx.

F. L. Washburn.—A few experiments in photographing living insects.

The following officers were elected for 1913.

*President.*—Charles J. S. Bethune, Ontario Agricultural College, Guelph, Ontario.

*First Vice-President.*—Philip P. Calvert, University of Pennsylvania, Philadelphia, Pennsylvania.

*Second Vice-President.*—William M. Marshall, University of Wisconsin, Madison, Wisconsin.

*Secretary-Treasurer.*—Alex. D. MacGillivray, University of Illinois, Urbana, Illinois.

Additional members of Executive Committee.–Herbert Osborn, Ohio State University, Columbus, Ohio; C. P. Gillette, Colorado Agriculture Experiment Station, Fort Collins, Colorado; Vernon

L. Kellogg, Leland Stanford Jr. University, Stanford University, California; James G. Needham, Cornell University, Ithaca, New York; C. T. Brues, Harvard University, Cambridge, Massachusetts. Nathan Banks, U. S. National Museum, Washington, D. C.

Member of Committee on Nomenclature.—E. P. Felt, New York State Entomologist, Albany, New York.

The Society will hold its next meeting with the American Association for the Advancement of Science at Atlanta, Georgia.

ALEXANDER D. MACGILLIVRAY, Secretary.

## BOOK NOTICE.

THE SPIDER BOOK.—A manual for the study of the Spiders and their allies, the Scorpions, Pseudo-scorpions, Whip-scorpions, Harvestmen, and other members of the Class Arachnida, found in America, north of Mexico, with analytical keys for their classification and popular accounts of their habits. By John Henry Comstock.. Doubleday, Page & Co., New York.

Spiders have received relatively little attention on this continent from systematic zoologists, considering the large size of the order, the abundance of many of the species in every locality, their exceedingly interesting and varied habits and the important *role* that they play in the economy of nature. The same statement might, indeed, be made to include the whole of the Class Arachnida, but, whereas the other order of the class are less obviously attractive, it is difficult to understand why the spiders have never been favourites.

The "Spider Book," which is an excellent introduction to the study of the Arachnida, and the spiders in particular, is therefore to be welcomed as a most important addition to American arachnological literature, particularly as it is not only adapted to the needs of the beginner, but will doubtless also form a useful book of reference for teachers and entomologists generally.

In the first chapter the general characteristics of the Arachnida and their relationships to other classes of Arthropods are discussed. The characteristics of the various orders are also given, with tables

for the separation of the families and genera, and in some cases the species. On account of its great size, the order Acarina (mites and ticks) is necessarily dealt with more briefly than the other groups, only the superfamilies being defined. Less space, for example, is given to this group than to the *Phalangida* (Harvestmen), a much smaller order.

In chapters II. and III. the external and internal anatomy respectively, of spiders, are discussed in considerable detail. A special section of the former is given to the description of the different types of male pedipalps, whose highly-complex structure is of great taxonomic importance, and has been a subject of special investigation by the author. Following the description of the different kinds of spinning glands at the close of chapter III. is a table, giving the names of these glands, with their number, the position of their spinning-tubes, their distribution among the various families and their functions.

Chapter IV. is an account of the life of spiders, and deals with this subject under a number of headings. Much attention is given to the description of the different kinds of silk and their functions, the types of webs, and to the structure and building of the orb type of web. The account of the development is rather brief, the embryological part being omitted altogether. This is, of course, to be expected in a popular work, but the "Spider Book" is more elaborate than popular works usually are, and we therefore think that a brief outline of the early stages of development would not have been out of place, considering the important bearing which the development of some of the organs, such as the book-lungs, tracheæ and spinnerets have upon the phylogeny of the group.

The systematic part of the book, comprising chapters V.-VII., is enlivened by interesting notes on the habits peculiar to the various families and genera, and by the numerous illustrations. Brief descriptions of many of the commoner species are given, as well as keys to all the families and genera inhabiting North America.

The copious illustrations, which are largely photographic reproductions of living or recently killed specimens and their webs and nests, are scattered throughout the text, and give the book a very attractive appearance by reason of their unusual excellence.

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## FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 68.)

356. *Cucullia montanæ* Grt.—I have no note of having seen the type of this species, which, according to Smith's Catalogue, is in the Neumœgen collection at Brooklyn, nor have I seen Grote's description. The Calgary form, however, agrees with the description of *montanæ* in Smith's Monograph, and is also the *montanæ* of the British Museum collection, with the exception of the actual specimen figured by Hampson, which happens to be a Denver, Colo., specimen of *asteroides*, of which the type is correctly figured on the next plate. It had not, until recently, occurred to me that there was any likelihood of confusing the two, but I must admit that I have examined, and now possess, specimens which I have had considerable trouble in determining. Generally speaking, whilst the arrangement of colour in the two is about the same, the shades in *montanæ* are more intense, that is, the pale shades are paler, and the dark shades darker. But the colour varies somewhat in different localities, and more reliable points of distinction are as follows. In *montanæ*, the basal area, as far as the t. a. line, is very pale fulvous. The t. a. line is double, with the included space of the same pale gray colour as the central and outer middle portion of the wing below the spots. In *asteroides* the basal space is unicolorous with the central and outer middle area, and the t. a. line is single, though traces of an inner portion are sometimes discernible. In *asteroides* the tegulæ have a black line near the base, which seems to be lacking in my *montanæ*, though Hampson gives it as present in both. Slightly worn or poorly-marked specimens are occasionally extremely difficult to place. I have not both species from one locality. *Montanæ* is recorded from Colorado, and I think I saw it from there in the British Museum, but a Colorado specimen in my collection, sent as *montanæ*, appears to me to be *asteroides*. I am certainly strongly under the impression that the two are distinct.

358. *C. florea* Guen., = *obscurior* Smith, = *indicta* Smith.—I have specimens compared by myself with all these types. That of *florea* is a female in the British Museum, from Trenton Falls, N. Y. *Obscurior* was described from two females taken by Bruce in Colorado, and a type is at Washington. My specimen compared with this type is from Glenwood Springs, and a Calgary specimen compared with types *florea* and *indicta* is exactly like it. I have three specimens from Kaslo. The "*florea*" of my original list (No. 360) was wrongly identified, and the Calgary specimen figured by Sir George Hampson as *florea* is, in my opinion, a strongly-marked form of *postera*. The two are more nearly allied than I at first thought, as my male type of *indicta* happens to be an unusually pale gray, even specimen. I have two Calgary specimens which puzzled me for a long time, and seemed almost to connect them. Generally speaking, *postera* is better marked, and has more obvious reddish brown shades on costal region of primaries. In *florea* such shades are absent, or nearly so, as in the type, and never conspicuous. What appears to me a more reliable character exists in the dark cloud or shade preceding the crescent-shaped mark formed by the t. p. line below vein 2. In *postera* this shade is itself somewhat crescent-shaped, and about concentric with the t. p. line crescent. In *florea* it is direct, oblique, and if produced would meet the inner margin below the orbicular, and the costa near the apex. The shade, however, is often very ill-defined, and not always symmetrical on both wings. But I have studied this feature very carefully, and conclude that it is characteristic of each species as a whole. The moth is a great rarity in this district, only three specimens having been taken besides those previously mentioned, on Aug. 1st, 1909, and June 5th and 11th, 1910. I saw a specimen bearing a New York label in the American Museum of Natural History which I took to be this species, and so labelled it. One in the Rutgers collection, labelled "New Windsor, N. J., May 27th, 1892, Emily L. Morton," appeared to be this, but had ochreous-tinted secondaries, differing in this respect from any previously seen.

359. *C. asteroides* Guen?—I was quite wrong in listing this species as *postera*. I have a manuscript name for it, and have several times been on the point of describing it, but shall not do

so until I have seen this and typical *asteroides* from the same locality and can distinguish them. The type of *asteroides* is from New York, and is well figured by Hampson. In it the ill-defined discoidal spots are pale fulvous, and slightly paler than the rest of the fulvous shade, which extends longitudinally through the upper portion of the wing. The secondaries are clear pearly-white, with dusky veins and outer border, though the border sometimes covers nearly half the wing. I have specimens of the typical form from New York, Rhode Island, Ohio, Pennsylvania, Illinois and Denver, Colorado. I gave the name to a Montreal specimen for Mr. Winn, on the strength of which it is entered in the Quebec list. The only other named species with which I am likely to have confused it is *montanæ*, as mentioned under that head. In the Calgary form the primaries differ but little, but are generally darker blue gray and more even, with the discoidals even less evident. But the chief difference is that the secondaries are smoky throughout, though darker outwardly. This form is the "*postera*" of the B. C. list, and I have specimens from Windermere and Nelson. Some from Manitoba are the darkest of the series, and differ most from true *asteroides*. The dark secondaries contrast strongly with the pearly whiteness of the typical form, and gives the insect a very different appearance, and the primaries of the dark series seem slightly broader and more rounded on the costa. But I must admit that with the primaries alone I might fail to distinguish between some of the specimens. I have not taken it at Calgary for several years.

360. *C. postera* Guen.—This is the "*florea*" of my original list. The Calgary form is figured by Hampson as *florea*, but seems to me darker and more strongly marked only than the type of *postera* from New York. The chief distinctive character between this and *florea* I have pointed out under the latter heading. Judging from the number I have seen, this species is, with the possible exception of *intermedia*, the commonest of the genus in Canada, though I have not seen it from west of the Rockies. I have named a Montreal specimen for Mr. Winn, which seemed to me about typical. In Prof. Smith's collection, the only specimen which stood under this name was a male from Liberty, N. Y. This was like the

Calgary form, except that it was ochreous-tinted throughout, which made me doubt its identity.

361. *C. speyeri* Lint.—Another female. July 10, 1900, formerly in my *intermedia* series, appears to be this species, but was labelled *intermedia* on Smith's authority. The error was excusable, as it is duller and less black-streaked than *speyeri* usually is, but has all the other characters of that closely allied species, including the pearly white though dusky-margined secondaries. I have the species from Illinois, Volga (S.D.), Colorado, and Aweme, Manitoba.

362. *C. intermedia* Speyer.—I consider that this is the correct name for the form occurring here. Any attempt to separate it from *intermedia* from the east is hopeless, though eastern specimens, as a whole, are a trifle darker, due to their being more suffused with brown shades. I have Calgary and eastern specimens matching exactly. Hampson figures a Calgary example as *cinderella*. The latter was described from a single Colorado male collected by David Bruce. I saw it in the Washington collection, and it has the transverse maculation almost obsolete. A Colorado female in the same collection certainly suggested a faintly marked *intermedia*. The validity of *cinderella* as a species is open to much doubt.

365. *Tapinostola variana* Morr.?—I had listed this species as *orientalis* Grt., but that, according to the description, has a t. p. line of blackish dots, and the subcostal and median nervures are finely lined within the cell with black. This sounds like the species figured by Sir George Hampson, from Renfrew County, Ontario, as *inquinata* Guen., of which he has the type from New York, and of which he makes *orientalis* a synonym. My notes on *inquinata* type do not mention a black streak immediately above the median vein, nor does Hampson mention it in his description in the Catalogue. His synonymy, however, is probably correct. Sir George's description is all I have of *variana*, besides a reference thereto by Grote, and the only difference mentioned is the absence of the t. p. line. Holland figures as *variana* a Winnipeg male from the Washington Museum. I compared this specimen and concluded that the Calgary species was distinct and also probably

distinct from type *inquinata*. But the Winnipeg specimen in question has an obvious t. p. line, which the type *variana* lacked, so that its identity is open to doubt. It is at any rate probably a species not at present in my collection and may be a pale *inquinata*. My Calgary specimens are about the colour of *inquinata* type, but lack all traces of a t. p. line, though some show traces of blackish in the cell. Besides the two before mentioned I have two males taken at light on Sept. 8th, 1906.

366. *Hydræcia nictitans* Bork.—I feel bound to follow Hampson in treating the North American species as identical with the European *nictitans*. Smith himself referred "Var. *americana* Speyer" to his *atlantica*, so that the former name should have preference in any case. A female type of *atlantica* from Ithaca, N. Y., is in the Washington Museum. No clear differences are pointed out, in fact the impossibility of distinguishing it from the European form except by male genitalia is admitted. Its range is given as "Nova Scotia, Hudson's Bay, Southward to Virginia, West to Colorado". *Interoceanica* was described from three specimens from Winnipeg only. I have none from there exactly, but have seen a pair of types. It was characterized as small and very dark in colour, with the ordinary markings almost blackish, and reniform white. The latter character is of course variable in *nictitans*. I compared Smith's types and did not consider them distinct, nor did they strike me as variations worthy of remark. *Pacifica* was stated to range from California to Vancouver and to be more compactly built than *atlantica* or *nictitans*, and a little more lightly shaded, "the secondaries yellowish or purplish red and somewhat silky, quite different from the eastern examples". I have no Californian examples, but numbers from Vancouver Island, and their variation is much like that of eastern specimens. Concerning his three new names Smith writes in his Revision; "These three species I could hardly have dared to separate from *nictitans* had it not been for the differences in structure in the male genitalia; but these are so radical that specific identity is out of the question". Four genitalic species are claimed for the British Isles, some of which are said to be locally constant in some superficial characters. Hampson unites them all as one species, but quotes six names as

aberrations, including two European, one Asiatic, and three North American; viz:

"*americana*.—Fore wing rather more orange-red. Eastern States and Canada.

*interoceanica*.—Fore wing browner. Western Canada.

*pacifica*.—Fore wing grayer, California." This latter is not in accord with Smith's diagnosis.

367. *H. pallescens* Smith.—The male and female types in the Washington Museum are from Calgary. They differ from *medialis* from Colorado in lacking the reddish tints, and in having the entire ground colour washed with white. Some Calgary specimens are a good deal darker than the type, but scarcely reddish. The form was not even recognised as a variety in Dyar's catalogue, though the difference in colour is somewhat striking. Hampson treats them as species. I think it likely that the differences are merely varietal, but have not seen enough Colarado material to enable me to form a fair judgment, and have none from there in my collection. Mr. Baird has taken *pallescens* at High River, and I have it from Cranbrook, B.C.

368. *Papaipema* sp.? The type of *impecuniosa* is a male from Massachusetts, and is in the British Museum. Sir George Hampson figures a specimen like it. There are two Red Deer River specimens from me in the same series. But, like the rest I have seen from that locality, they differ from *impecuniosa* in the form and course of the central shade, which is more like that in *purpurifascia*, *rigida* and *verona*, the latter being a much paler thing from Winnipeg. The form of the t.p. line is something between that in *impecuniosa* and *purpurifascia*. The colour and maculation otherwise is much like that of *impecuniosa*, but the orbicular and claviform may be either yellow or white. Unfortunately I have only three specimens now left in my collection, not having visited the locality for some years.

(To be continued.)

## AN ENTOMOLOGIST WANTED FOR ARCADIA

"The Agassiz Association's ArcAdiA is for study and research and for giving information upon any phase of nature to any person who desires to know."

ArcAdiA is well equipped with every facility for studying nature, and especially so in entomology. Within the adjacent territory, especially in Nymphalia, which is a part of ArcAdiA, there are facilities for studying various kinds of aquatic and marsh insects. The laboratory is well equipped with apparatus for classifying, examining, photographing, etc. There are breeding cages for studying the insects in their transformations, and whatever further equipment may be necessary will be made to suit the needs of a student. We want an adult entomologist, preferably a married man, to come to ArcAdiA, lease a building site, erect a small cottage, and live near to nature in the spirit of the Institution. He shall have the freedom of the Institution without expense, but for his services no salary will be paid. We are looking for some one who has retired from the active duties of life, and expects to spend the rest of his days in close proximity to the entomological world.

The experiment has been successfully made in the Department of Botany. Some three years ago a lady in Wisconsin desiring to devote the rest of her life to the study of plants, became a member of The Agassiz Association, at the cost of only three dollars for the first year and only a dollar and a half each year thereafter. She leased a building site and erected, at her own expense, a portable cottage, in which and in the surroundings she leads the ideal ArcAdiAn life in nearness to nature. She devotes all her spare time to the Botanical Department, collecting plants, studying them in their habitat, planting them in her little yard, and studying them under the microscope. A pleasurable part of her occupation is to show the results to the admiring visitors at ArcAdiA. The Agassiz Association remunerates her for her services in giving her all the facilities of the equipment, such as may be needed in her botanical pursuits. In return for her services she receives the best pay in the world—the joy of doing and the joy of helping.

Her attractive little cottage is known as Botany Bungalow. We want some entomologist to make his home in the "Entomologist's Eyrie" or "The Ant Hill," or some similarly named cottage in ArcAdiA. Full particulars as to what the AA is and what is its ArcAdiA, what it has done and what it is trying to do, and

including a copy of "The Guide to Nature," will be sent upon application.

On the other hand, full particulars will be required of the personality, skill, experience, plans, etc., of the applicant who would come here and take charge of our Entomological Department. We would prefer someone who has retired from active business life and has means to devote the rest of his days to his favorite pursuits, but such entire devotion of time is not necessary. Arrangements could be made for some income for services, if desired. Employment of various kinds can be obtained in the vicinity, but, as previously stated, the ideal would be one who has retired and intends to devote all the rest of his time to the interests and beauties of entomological nature.

For further particulars, apply to The Agassiz Association—Edward F. Bigelow, President—ArcAdiA, Sound Beach, Connecticut.

## THE COTTON MOTH, *ALABAMA ARGILLACEA* HBN.

The photograph from which the accompanying illustration was made, was sent to me by Mr. J. F. Calvart, of London, Ont. These moths were noticed in very large numbers this autumn in Western Ontario. At London, they appeared suddenly either late in the

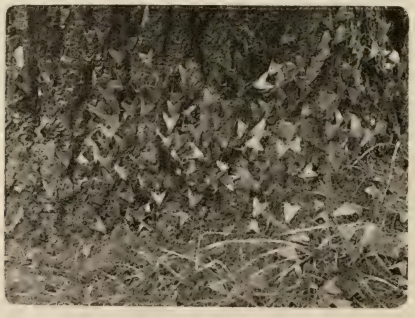

FIG. 2

evening of Oct. 10, or early in the morning of Oct. 11. The characteristic habit of the moth of resting with its head downward is well shown in the illustration. An account of the occurrence of this moth in eastern Canada in 1912 will appear in an early issue of the Ottawa Naturalist.—ARTHUR GIBSON, Div. of Ent., Ottawa.

# ON SEVERAL NEW GENERA AND SPECIES OF AUSTRALIAN HYMENOPTERA CHALCIDOIDEA.

BY A. A. GIRAULT, BRISBANE, AUSTRALIA.

The following genera and species were included within three small collections of this super-family, loaned to me for study, but do not include all of the material from them. Two of these collections were from Queensland, the third partly from Victoria and partly from New South Wales.

Family Chalcididæ.
Subfamily Chalcidinæ.
Tribe Chalcidini.
Genus *Tumidicoxa* Girault.

1. *Tumidicoxa rufiventris* new species.

*Female:* Length, 5 mm.

Opaque black, the abdomen rufous or orange red, as are also the antennal flagellum, the posterior coxæ, tibiæ (except at tip) and femora (except at apex, lateral), the cephalic tibiæ, except at base, and all the tarsi (somewhat diluted with yellowish); cephalic and intermediate coxæ black or very dark, the proximal half or more of the cephalic and intermediate femora black, their distal half or less honey yellow. Scape dark fuscous, the pedicel somewhat lighter. Tegulæ, a rounded spot at apex of posterior femur laterad, a distinct oval spot near tip of posterior tibiæ and the knees more or less lemon yellow. Wings very slightly stained throughout, the venation smoky. Pubescence not conspicuous, with a reddish tinge.

Scrobicular cavity nearly smooth, shining; head and thorax rugoso-punctate, the propodeum mesad (dorsal aspect) foveate, the abdomen glabrous, but the distal segments finely, polygonally sculptured. Lateral ocelli distinctly more than their own diameter from the eye margin. Plate at apex of scutellum distinctly bilobed. Propodeum in the dorso-lateral aspect, with at least one tooth-like projection, its lateral aspect moderately hairy, but not conspicuously so. Posterior femora with one moderately large tooth, followed by about ten others, which are smaller distad, all the ten much smaller than the first. Antennæ 12-jointed, the single ring-joint large, the pedicel as long as the first funicle

joint, which is somewhat wider than long, the remaining joints all wider than long, except the distal club joint, which is longest, conical; distal funicle joints transverse; flagellum clavate, somewhat compressed.

(From two specimens, two-thirds of an inch objection, 1-inch optic, Bausch and Lomb.)

*Male:* Not known.

Described from two female specimens mounted on pins, labelled "Warburton, Victoria." This species differs from the South American forms strikingly in coloration; also the funicle joints of the antennæ are shorter, the pedicel longer in relation to them, the lateral ocelli farther away from the eyes, the plate of the scutellum more deeply lobed and the stigmal vein not sessile, yet short. Otherwise, it is similar in all details, with the possible exception of the ventral plate on the thorax, which I was unable to see in these specimens because of the manner in which they were mounted.

*Habitat*: Australia—Warburton, Victoria.

*Types*: No. *Hy 1178*, Queensland Museum, Brisbane, the above specimens (2 pins) plus a slide bearing an antenna and a posterior leg.

2. *Tumidicoxa flavipes* new species.

*Female:* Length, about 5 mm.

Like the South American species, but the plate at the apex of the scutellum is not emarginate at the meson, or barely so. Opaque black marked with lemon yellow as follows: The tegulæ except at extreme base (cephalad), tibiæ and tarsi, except the brownish base of posterior tibia and parts of the distal tarsal joint, distal half of cephalic femora, distal third of intermediate femora and the tip of the posterior femora. Legs otherwise black, reddish black on femora and tibiæ on first two legs. Venation and antennæ brownish black, the latter really black, brownish toward tip. Wings perfectly clear. Body rugoso-punctate, the second abdominal segment shining. Pubescence not conspicuous. Antennæ 12-jointed, cylindrical, with one ring-joint, the pedicel small, wider than long, not half the length of the proximal funicle joint, which is the longest joint of the flagellum. Distal club joint longer than the other, obliquely truncate at tip. Distal

funicle joint slightly wider than long, the middle joints subquadrate. Scape short, simple. Posterior femora beneath the others, the last three distinctly smaller in succession, the last very small. The teeth are black, and they rather increase in size at the middle (Nos. 5, 6 and 7 from proximal end). Posterior femur minutely punctulate and clothed with soft, greyish pubescence. Agreeing with the generic description, except as may have been noted. The lateral ocelli are somewhat farther away from the eyes.

(From a single specimen, the same magnification.)

*Male:* Not known.

Described from a single pinned female labelled "Dandenong Range, Victoria."

*Habitat:* Australia—Victoria (Dandenong Mountains).

*Type:* No. *Hy 1179*, Queensland Museum, Brisbane, the above specimen on a card; an antenna on a slide.

3. *Tumidicoxa victoria* new species.

*Male:* Length, 6.1 mm.. Rather large.

Like the preceding species, but larger, more robust, the plate at the apex of the scutellum plainly bidentate, the scape longer, the black parts of the legs darker, and specifically the cephalic tibiæ are brown in the middle, the intermediate ones along the proximal half, except at base and the posterior ones, black in the middle, their tips pale yellowish. The posterior fermora beneath bear nearly the same arrangement of teeth, but there are only eleven, followed by a minute tubercle; numbers 3 and 4 are larger than 2 and those distad of them. The posterior coxæ have a flabellate enlargement at the apex above. The antennæ 12-jointed, the distal funicle joints more transverse than with *flavipes*. Wings hyaline.

(From a single specimen, the same magnification.)

*Female:* Not known.

Described from a single male, minutien-mounted and labelled "Dandenong Ranges, Victoria."

*Habitat:* Australia—Victoria (Dandenong Mountains).

*Type*: No. *Hy 1180*, Queensland Museum, Brisbane, the above specimen plus an antenna on a slide.

4. *Tumidicoxa regina* new species.

*Male:* Length, 4.95 mm.

Like *flavipes*, but more robust, the scutellum terminating in a distinctly bidentate plate and the postmarginal vein longer. The scape is also longer. Posterior femur armed with twelve teeth, the first large, the next two very small, followed by seven larger ones, (of which numbers six to nine are largest) and two shorter ones, the last broad, its flat upper edge at apex thus emarginate; excluding the first tooth, numbers 6 to 9 are largest. In *flavipes*, teeth Nos. 2 and 3 are not distinctly smaller than the ones immediately following (distad).

(From one specimen, the same magnification.)

Female: Not known.

Described from a single male specimen on a pin, from the collections of the Queensland Museum, labelled "Brisbane, H. Hacker. 3–7–11."

*Habitat:* Australia—Brisbane, Queensland.

*Type:* No. *Hy 1181*, Queensland Museum, Brisbane, the forenoted specimen on a pin, plus one slide bearing antennæ and a posterior leg.

*Pseudepitelia* new genus.

*Female:* Resembling *Epitelia* of Kirby, but the abdomen not produced into a stylus distad, the posterior femora without depressed punctures and armed beneath with more teeth, there being six moderately large, more or less, subequal teeth (but the first largest), followed distad by four others, which shorten in succession. The antennæ are 13-jointed, with one ring-joint, inserted nearly on a line with the ventral ends of the eyes. the scrobicular cavity reaching the cephalic ocellus, the lateral ocelli plainly more than their own diameter from the eye margin. The postmarginal vein about half the length of the marginal, slender, the stigmal very short, yet with more or less of a distinct neck. The second abdominal segment occupying more than a third of the abdomen. Propodeum with two small, acute projections in the middle of the dorso-lateral line (seen from ventro-laterad). Body nonmetallic, punctate. Abdomen as in Chalcis. The scutellum terminates in a short, bidentate plate.

*Male:* Not known.

*Type*: The following species.

1. *Pseudepitelia rubrifemur* new species.

*Female:* Length, 5.10 mm.

Opaque black, the second abdominal segment glabrous black, the posterior femur dark reddish, the venter of the abdomen at the meson more or less suffused with dark reddish or yellowish; tegulæ pallid, the wings hyaline, the venation black, face and distal half of the abdomen pubescent. Tarsi more or less brownish. Intermediate and cephalic knees and two distinct elongate spots on each end of the posterior tibiæ exteriorly and not at tip, pale yellowish. Antennae wholly black.

Body moderately finely, densely punctate, the spaces between the punctures lined. First abdominal segment, with very minute punctures, which vary in size, the following segments pubescent and transversely wrinkled, the penultimate segment rougher. Posterior femora densely punctulate the punctures very minute; antennæ, with the distal joint very short, truncate, only about twice the length of the ring-joint; scape very long, narrowing distad; pedicel much longer than the ring-joint, but only half the length of the proximal funicle joint, which is longest of the funicle, twice the length (or nearly) of the subquadrate distal funicle joint. Proximal two joints of the club subequal, the distal joint flat, very short.

(From one specimen, the same magnification.)

*Male:* Not known.

Described from a single cardmounted female, labelled "Cheltenham, Victoria."

*Habitat:* Australia—Victoria (Cheltenham).

*Type:* No. *Hy 1182*, Queensland Museum, Brisbane, the above specimen, plus a slide bearing an antenna and a posterior leg.

2. *Pseudepitelia tricolor* new species.

*Female:* Length, 5.00 mm.

The same as *rubrifemur*, but the postmarginal vein shorter and stouter, the second (distal) elongate, pale yellowish spot exteriorly on posterior tibia absent, but the two proximal tarsal joints (and less so, the third) of posterior legs white, suffused with

yellowish; the scutellum has not a small patch of greyish pubescence at apex, just above the terminal plate as with the type specimen (*rubrifemur*) and in *tricolor* the third abdominal segment is more roughly finely sculptured. There are eleven distinct teeth on the posterior femur instead of the ten of the type species. Intermediate and cephalic tarsi white or whitish. (Antennæ missing; scape black.) Wings hyaline.

(From a single specimen, the same magnification.)

*Male:* Not known.

Described from a single cardmounted specimen from the collections of the Queensland Museum, labelled "Q.M. Tambourine. H. Hacker, April 2, 1911."

*Habitat:* Australia—Tambourine, Queensland.

*Type:* No. *Hy 1183*. Queensland Museum, Brisbane, the above female on a card.

*Brachepitelia* new genus.

*Female:* The same as the preceding genus, *Pseudepitelia*, but the antennæ 12-jointed, the scutellum terminating in a short plate, whose distal margins are straight, the plate barely differentiated, The submarginal vein is shorter and stouter. Propodeum without noticeable lateral projections. Second abdominal segment occupying nearly half of the abdomen.

*Male:* Not known.

*Type:* The following species.

1, *Brachepitelia rubripes* new species.

*Female:* Length, 3.70 mm.

Opaque black, marked with dark red as follows: Posterior legs except coxæ; cephalic knees, tibiæ and tarsi; intermediate knees and tarsi (mixed with brownish) and the ends of the tibiæ. Venation dark, the wings hyaline. Head and thorax rugoso-punctate. Posterior femur with ten distinct teeth, the first twice the largest, the distal teeth smaller in succession.

*Male:* Not known.

Described from a cardmounted female, labelled "Larva of Various Moths, Melbourne."

*Habitat:* Australia—Melbourne, Victoria.

*Type:* No. *Hy 1184*, Queensland Museum, Brisbane, the above specimen; an antenna on a slide.

(To be continued.)

# REMARKS ON THE DISTRIBUTION OF HETEROPTERA.

BY J. R. DE LA TORRE BUENO, WHITE PLAINS, N. Y.

Among the many problems of nature that engage the attention of the biologist there is one that to me has always been of the utmost interest. It is that of the occurrence of the same species in widely separated regions or through extensive and seemingly dissimilar areas or in isolated and restricted habitats. The classic example of the last, familiar to all entomologists, is the peculiar subarctic and alpine butterfly *Oeneis* or *Chionobas semidea* which from the wilds of Labrador jumps to the high peaks of the Presidential Range of the White Mountains and again is not found till we come to the Rockies in Colorado. Here, however, we have a tenable explanation for this great and peculiar range, in the fact that this is an arctic genus which spread during the ice-age throughout its vast territory, and which, with the recession polewards of the ice cap and the frigid temperatures it caused, travelled northward in its wake. Some, however, followed the receding line of perpetual snow up the mountain sides, and where these were of sufficient altitude, they have contrived to maintain themselves to this late date in the geological history of the earth.

In this paper the Hemiptera only are to be considered, more especially the Heteropterous forms supposed to be common to America and Europe. At the outset we are confronted with a difficulty, which arises from the mistaken reference of American species to European forms. This troublesome condition is directly due to the meagre descriptions of the older authors, who availed themselves principally of colour for specific distinctions and put the structural differences in the generic characterizations. In part, however, our native entomologists are at fault, since much of this confusion can be traced to their neglect of the study of the cognate European species, which, even though they are of the same colour patterns as ours, in so far as any written description can go, are nevertheless sufficiently different in form and structure to be readily distinguishable by the trained eye. This condition in the Hemiptera is being rapidly adjusted, due almost entirely to the labours of the Europeans. In fact, our own present lack of sufficient acquaintance with their writings leads some of us to the perpetuation of errors long since dispelled. It

is to the labors of those eminent scientists, Prof. Momtandon and Dr. Horvath, but mainly to the latter, that we owe what has been done towards correcting these mistakes. Horvath's visit to the United States in 1907 and the collecting he then did, enabled him to make the necessary comparisons, and it is his results which form the groundwork for this discussion.

In the writings of the fathers of American Hemipterology, we find much of this erroneous work, in their case most unfortunately unavoidable owing, as already pointed out, to too great reliance on colour characters alone. Thomas Say, who needs no praise to establish his position as the greatest of American entomologists, had indeed a keen and discriminating eye, and nearly without exception his species and genera have withstood the most rigid tests. His successors however, have not been so uniformly successful, so we have for America a list of species of supposedly European Heteroptera (to which in the heat and haste of Hemipterological youth I have added my mite), which includes such species as:

*Reduvius personatus* L.
*Sciocoris lectularius* L.
*Sciocoris microphthalmus* Flor.
*Nezara viridula* L.
*Zicrona cærulea* L.
*Corizus crassicornis* L.
*Corizus hyalinus* Fabr.
*Nysius thymi* Wolff.
*Nysius ericæ* Schill.
*Stygnocoris rusticus* Fall.
*Sphragisticus nebulosus* Fall.
*Scolopostethus thomsoni* Reut.
*Aradus crenatus* Say.
*Aradus lugubris* Fall.
*Aradus cinnamomeus* Panz.
*Harpactor leucosdilus* Stal.
*Gerris rufoscutellatus* Latr.
*Acanthia pallipes* Fabr.
*Acanthia xanthochila* Fieb.
*Corixa germari* Fieb.
*Corixa præusta* Fieb.

These do not include the ones subsequently recognized as undescribed, such for example as *Cymus claviculus* Fall., which turned out to be new and was described by Horvath as *discors*; *Emblethis arenarius*, which comparison with European material showed to be different and which is now known as *vicarius* Horvath; *Pentatoma juniperina*, which is restricted to the other side of the Atlantic, ours being described as new under the name of *persimilis* Horvath.

Returning to the larger aspect of the question, a consideration of the hemipterous forms common to the two continents discloses the fact that in preponderating numbers these are phytophagous and parasitic, the majority being Homoptera of families notoriously injurious to vegetation, namely, the Jassidæ and Aphididæ. The total number of species of this order found on both sides of the Atlantic is in the neighborhood of 160 to 170, a very small number as compared with the Coleoptera.

How are we to account for this dispersal? There are two chief means, the one natural, by migration of the living beings of their own impulse, and the other artificial, through the agency of man. A large proportion apparently belong in the first category. The small remainder, (including therein the classic examples of the unsavory bedbug and other obnoxious personal parasites), owe their distribution undoubtedly to the more or less involuntary agency of man. To-day the constant importation of nursery stock is bringing with it a constant transfer to this continent of various plant pests. Fortunately, the strict surveillance on plants brought from abroad has thus far held in check the spread of these insects to any great extent. On the other hand, sometimes the good perish with the bad, and important predators are fumigated out of existence together with their prey.

An examination of the forms which evidently owe their distribution to natural agencies has shown that the great majority belong to Palæarctic genera and are in the main Palæarctic species of the most widespread character. Take for example *Gerris rufoscutellatus* Latreille, which is without doubt the Hemipteron of widest actual distribution next to *Nezara viridula*. It is known across Northern Europe through Siberia, thence to British Columbia and Oregon, ranging East to the Northern

Atlantic region. Here we have a form undeniably Palæarctic in origin, which has migrated from its native source and travelled 15,000 miles to found its colonies throughout the North Temperate Zone. Its route has certainly been via Bering Straits into Alaska and thence east and south. Its habitat and its predaceous nature have both contributed largely to its fitness for this long voyage. It is furnished with good wings, sucks any insect it can overcome and lives on the surface of the water. It has therefore had an unimpeded and favourable route from the land of its nativity eastward until stopped at the impassable barrier of the Atlantic ocean. Thus also must have migrated the two Corixas, *germari* and *præusta*, out from the Palæarctic region.

This also is the route followed by many of the land bugs, but they indeed must have met the great obstacles, saving only the semi-aquatic strong-flying and predaceous Acanthiidæ, to whom the waters can have no terrors. A number of these terrestrial forms are cannibals and live on other insects, their only requirement being that their prey be not encased in impenetrable armor or too large to be overcome. *Zicrona cærulea* may serve as an example of these carnivores, and here we see how much slower has been its progress than that of the aquatic forms, and seemingly it has met with an unsurmountable boundary in the Rocky Mountains. The advent of the phytophagous forms is similarly explained for the majority of cases, in view of the adaptability of the Hemiptera to any vegetable food other than their native food plants, especially when pressed by hunger. The dispersal of one land group, however, is a subject for interesting speculation. I refer to the three species of Aradids common to the Eastern United States and Western Europe. Is this their native home? The genus Aradus is boreal in its origin. This much is reasonably certain. But are these three species themselves of Palæarctic or Nearctic origin? And if of Palæarctic origin, how did they get there? And if not, how did they cross Europe?

*Aradus crenatus* was described by Say in 1832; subsequently Herrich-Schaefer described it and figured it in Wanzenartigen Insekten (IX., fig. 538, p. 90), under the misnomer *corticalis;* and in 1860 Leon Dufour described it as new, and called it *dilatatus*.

So far as I know, it is confined to the Atlantic States and Western Europe. *Aradus cinnamomeus* is in the same case; and *Aradus lugubris* of Fallen was independently recognized by Say also in 1832, who called it *rectus*, and by Kirby in 1837. It appears to extend throughout the northern part of this continent, from east to west and through Siberia into Western Europe. Seemingly, then, *lugubris* has come in by way of Bering Strait, and has travelled eastward. As to the other two, their dispersal might seem to indicate human agency. It is conceivable that they have travelled east into Europe, or west out of Europe concealed in crevices in logs and planks or under loose bark. The earlier discovery of *crenatus* in this country might appear to indicate its American origin, while the fact that *cinnamomeus* is first recognized in Europe might perhaps lead to the inference that that was its native soil, but possibly erroneously, since being a dweller in pine trees it may conceivably have been exported in such timber from this Continent.

There is another small group with a most remarkable distribution. The type of these may be considered to be *Nezara viridula*, which occurs with us commonly in Florida, and thence down into tropic America, across the ocean into Africa, throughout Europe and thence into Asia. Its home is said to be in Africa, whence it has spread so widely. How? No explanation seems to have been offered of its wanderings, but certainly there is no question of the identity of the species, even though the examples come from many lands. In this class, also, belongs *Corizus hyalinus*, which has spread even unto the distant isles of the Pacific Ocean.

It has not been the intention in these remarks to go deeply into the subject or to expound a theory, but simply to set forth a peculiar biological phenomenon and one well worthy of serious consideration and study. A few forms in a restricted group have been referred to, but all orders of insects present the same problem. Where the migration is over extensive land areas with a more or less homogeneous character of vegetation, or when one certain foodplant is widespread, the question presents no difficulties, but where large bodies of water intervene, it becomes more complex, and is a fit subject for scientific inquiry of a high order.

## ON THE GENUS *LAMENIA* STAL.

BY F. MUIR, H. S. P. A. STATION, HONOLULU.

Stal founded the genus *Lamenia* in 1859 (Eugenies Resa Zoo., 277, Pl. IV., f. 5), for *caliginea* from Tahiti, and the genus *Herpis* in 1861 (K. Vet. Ak. Hanal., III., No. 6, p. 8), for *fuscovittata* and four other species from Brazil; in 1866 in a footnote on page 193 of Hemiptera Africana he sank *Herpis* and *Lamenia*. Uhler in 1889 (Stand. Nat. Hist., II., 233), placed *Pæciloptera vulgaris* Fitch into *Lamenia* and since then several North American species have been placed in this genus, all congeneric with *vulgaris*. Fowler's *Cedusa funesta* is congeneric with *vulgaris* and (according to Melichar, 1905, Wien. Ent. Zeit., 285), *Attalia = Herpis*.

Stal's figure of *caliginea* is very clear, and shows the narrow, parallel-sided form of the tegmen with the subcosta and radia amalgamated to near their apices, and the subcostal cell small, a tegmen typical of *Thyrocephalus* Kirkaldy, whereas *vulgaris* and its allies have the tegmen much broader, the subcosta and radia separate from near the base and the subcostal cell large. For these reasons I do not consider it advisable to keep *vulgaris* and *caliginea* in the same genus. All the specimens I have seen from Central and South America are congeneric with *vulgaris* so that it appears best to place that species along with all its allies under *Herpis* and to have *Lamenia* with its type only, or to place all the eleven known species of *Thyrocephalus* under the latter genus.

*Cenchrea dorsalis* appears to differ from *Herpis* in having no subantennal keel across the gena, the antennal chamber being entirely pronotal (Westwood's figure of the tegmen also shows differences, which I do not like to emphasize until I can examine a specimen); from *Syntames* it differs by the absence of a central longitudinal keel on face, and from *Basileocephalus* and *Phaciocephalus* by the presence of a transverse keel between vertex and face.

## OBITUARY.

Mr. L. E. Ricksecker, well-known collector of California insects, died in San Diego in that State, January 30, 1913. He was especially devoted to the collection of Coleoptera, and distributed amongst his correspondents in the east many interesting specimens.

## A NEW SPECIES OF CORIXIDÆ.

BY J. F. ABBOTT, WASHINGTON UNIVERSITY, ST. LOUIS.

*Palmacorixa buenoi*, new species.

With the general facies of *P. gillettei* Abbott, from which it differs in the coarser texture of the tegmina, the character of the lineations and in the palæ of the male and the first femora of the female. The discovery of a second species of this genus necessitates a revision of the generic diagnosis given with the original description (Ent. News, XXIII, 337). The genus may be characterized as follows: Elongate, tegmina tapered posteriorly, with vermiculate markings. Male palæ thin, plate-like, pegs variable. Large stridular area on femur. Metathoracic wings aborted in both sexes. Male asymmetry and strigil dextral ; fifth tergite entire, sixth divided.

Description: Similar to *P. gillettei* in size and appearance, in the flattened short pronotum, and large head, with prominent posterior angles. Dark yellow to smoky brown, and much darker than *gillettei*. The tegminal lineations are complete, more or less inosculated and confused, but without a marked tendency to longitudinal seriation. Lineations of clavus complete—i.e., not effaced on the inner anterior area as in *gillettei*. Head smoky brown; its length 1¾ in the width in the male, 2¼ in the female; interorbital width twice in the head length in the male, 1¼ in the female. Male fovea more prominent than in *gillettei*, reaching the middle of the eye and clothed with delicate depressed hairs. Pronotum flattened, margined, lenticular in outline, evenly rounded posteriorly, dull and minutely rastrate, with 7–8 approximately parallel lineations, which are more or less broken. the lineations about as wide as the yellow interspaces. Posterior margin brown. Claval lineations delicate, vermiculate and inosculate, covering the whole clavus, fused externally to form a more or less definite oblique line parallel to the corio-claval suture. Clavus rather infuscated and clouded across the middle third. Markings of corium similar to those of clavus, running without interruption over the membrane; inosculated, but scarcely interrupted, sometimes fused into one or two rather indefinite longitudinal lines, which do not extend beyond the embolium. Surface of clavus and corium rather dull and rough, the clavus usually

rastrate, the corium merely punctate. Margins of embolium and of clavus elevated. Lower surface and legs pale; posterior tibia fringed with brown hairs. Metaxyphus very short, acuminate. Strigil rounded, 5 striæ, diameter 0.1 mm.

Male palæ cultrate, somewhat produced at the base, the length three times the greatest height. Pegs blunt, elongate, 24–33 in number. The distal ones are somewhat longer and crowded, and may be displaced into two irregular rows; the main row begins midway the base and rises in a curve after the first half dozen pegs; then follows the upper margin, but at some distance from it. A second row of peg-like spines along the lower margin, about 1½ to 2 times the length of the pegs. Tibia subglobular, about as high as the pala. Femur oblong, a little less than twice as long as wide, the stridular area covering the proximal half and consisting of short spines set in transverse rows. Female palæ cultrate, not produced at base, slightly more than three times as long as wide, broadly joined to the tibia. Tibia rounded oblong, tapered proximally, twice as long as high. Femur oblong, 2½ times as long as wide (the width at base in *P. gillettei* is two-thirds the length) with stridular (?) spines on the surface as in *P. gillettei*. Second leg: Femur 2½ times the length of the tibia, the latter equal to the claws,* and 1⅓ the length of the tarsus. Length, 5½–6 mm.; width across pronotum, 1½ mm.

Types 2 ♂ and 2 ♀ from White Plains, New York, collected in August and September by J. R. de la T. Bueno. Other specimens have been examined from Washington, D.C. (coll. W. L. McAtee) Oglethorp, Georgia (coll. T. C. Bradley) Hadley, Mass. (coll. C. A. Frost) and Valhalla, N.Y. (coll. Bueno). The species, therefore, appears to be distributed pretty widely up and down the Atlantic Coast of the United States.

Variation.—Some twenty specimens have been examined in addition to the described types. These individuals show a wide range of variation, such that the extremes would seem to belong to different species were it not for the intergradation. The writer has been unable to find any constant character, however, which would serve as a basis for discrimination. The smallest (White

*Through a *lapsus calami* these are called "spines" in the description of *P. Gillettei* (l. c., p. 339).

Plains) measures but 4¼ mm., the largest (same locality) 6½ mm. The tegminal surface may be smooth and polished, or dull and rastrate, the lineations varying from the regular complete lines of the type to interrupted and confused markings, resembling those of *P. gillettei*; the inner angle of the clavus, however, is never bare of lineations. Pronotal lines 6–9, either entire or much broken and confused. The index of pronotal width divided by pronotal length ranges from 2.22 to 2.60 in the ♀, and 1.79 to 2.73 in the ♂; that of the head width divided by the interorbital width ranges from 2.87 to 3.57 in the ♀ and from 3.60 to 4.20 in the ♂; that of the head width divided by the head length from 2.07 to 2.60 in the ♀ and from 1.68 to 2.33 in the ♂. In the male the palar pegs are sometimes crowded into two rows at both ends of the series. The absence of functional wings in both sexes in this genus certainly interferes with the rapid dispersal or mixing of individuals from adjacent localities, and thus brings about a partial segregation which would preserve and intensify aberrant variations. This possibly explains the very unusual range of variability above described.

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## ENTOMOLOGICAL MEETING IN CALIFORNIA, 1915.

The Entomological Society of America has received an invitation from the Panama-Pacific International Exposition to hold a meeting in some Californian locality in the summer of 1915. This gathering may be at either of the Universities or on the Exposition Grounds. It has received the enthusiastic support of western entomologists. These latter have attended many eastern meetings, and this is an excellent chance for us to return the compliment. It may be possible for a number to go out with a party, stopping off at one or more interesting points en route. As chairman of a special committee to consider this matter and report at the next meeting of the Association, the undersigned would welcome suggestions in regard to this meeting, and also expressions relative to the support it would probably receive from eastern entomologists.

E. P. Felt, State Museum, Albany, N.Y.

## BUMBLE BEES AND WASPS WANTED.

Mr. F. W. L. Sladen, Assistant Entomologist for Apiculture, Division of Entomology, Department of Agriculture, Ottawa, is making a special study of the Bumble Bees (genera *Bombus* and *Psithyrus*) and the Social Wasps (genera *Vespa*, *Polistes* and *Polybia*). He would be glad if anyone who finds a bumble bee's nest would send him a few specimens of the bees, without destroying the nest, so that he may determine the species. He would also like to receive specimens caught on flowers, especially in out-of-the-way districts.

Bumble bees and wasps are best killed with cyanide of potassium. Crushed tissue paper should be placed in the killing bottle to absorb any moisture, which otherwise mat and spoil the coats of the specimens. Wasps should not be allowed to remain in cyanide fumes for long, or their yellow markings will turn red. The specimens should be packed in soft tissue paper, or mounted on entomological pins and labelled with the date and *locality* of *capture*, and *also the collector's name*, and sent in a strong box, by mail, to the "Dominion Entomologist, Central Experimental Farm, Ottawa." Postage is free.

Specimens should be in good condition, not faded or damaged by exposure, and should include the large queens that are to be found chiefly in May and June, as well as the smaller workers that occur in abundance in July and the males that are common in August and September. Any notes on their habits and about the flowers they frequent and pollinate would be valued.

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## OBITUARY.

We regret to record the death of William Greenwood Wright at San Bernardino, California, at the age of 83. Mr. Wright travelled extensively on the North American continent, collecting chiefly Lepidoptera. He assisted W. H. Edwards in the preparation of his "Butterflies of North America", but his most important work was "The Butterflies of the West Coast" published in 1905. He contributed to this Journal.

# THE DISASTROUS OCCURRENCE OF *VANESSA CALIFORNICA* IN CALIFORNIA AND OREGON DURING THE YEARS 1911–1912.

BY F. M. WEBSTER, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

The interesting note of Mr. J. B. Wallis on the occurrence of this species at Peachland, British Columbia, in 1912, as given in the "Canadian Entomologist" for December, 1912, comes in very appropriately with the notes and observations made by correspondents of this Bureau, at Lakeview and Waldo, Oregon, and Willow Ranch, California. As the Bureau of Entomology is not likely to publish on this species in the near future, the information here given may be useful in case there should be a re-occurrence of these caterpillars during the summer of the present year.

Our first report of injuries by these caterpillars came from Mr. T. V. Hall, of Lakeview, Oregon, under date of July 27, 1911. Mr. Hall states that there had suddenly appeared in his neighborhood a worm which had taken almost the entire alfalfa crop. "Also has entirely destroyed the prospects for seed, which usually brings in to the farmers of this neighbourhood about $40,000 annually. The worm is from one-half to one inch in length and slender; perhaps 1-8 to 1-12 in thickness, brownish color and sleek appearing surface. It destroys the small tender alfalfa entire. The more mature growth it takes all but the fibre. This worm travels in vast armies. It almost seems as though the ground were in motion when they are in motion. The oldest settlers here state that nothing of the kind has ever appeared here before. This history reaches back at least forty years. We would like well to learn of some method for their destruction, or some way of preventing a repetition of the past, for they have caused a total loss to the year's crop."

The next report came from the same locality, under date of August 25, 1911, from Mr. A. J. Swift, who sent two specimens of these butterflies, which, he says, had been produced in his locality in enormous numbers during that month. Mr. Swift's further statements relative to this occurrence are given in his own words. "So far as known, this butterfly has never occurred here before, or at least in such small numbers as to have escaped comment.

This year, during July, various sections of the country have been covered with a worm of various sizes, but sometimes as large as 1½ inches long and near a ¼-inch in diameter. As I remember it now, it had two pairs of legs forward and three pairs aft, and varied in color with its food supply, some specimens being a bright green and grading from that to nearly black. The worm did immense damage to growing alfalfa and grasses, but so far as I am advised, did not trouble the trees. After the passing of the worm, this butterfly developed, which in its original swarming filled the air with myriads of them, and at this place the entire swarm was headed in one general direction, west, in very rapid flight."

Our next report for 1911, by a coincidence, was of the same date—August 25—from Mr. J. J. Monroe, of Willow Ranch, California, whose letter appears to be of sufficient interest to give in full.

"About June 1, of the present year, an old gardener told me that he noticed many of the specimens of butterfly I send you flitting about his garden and alfalfa fields. About six weeks later many of the destructive larvæ were noticed in the alfalfa fields and in gardens. Thousands of the larvæ left the hay (alfalfa) that I hauled into my barn and attacked one of my gardens which was nearby—i.e., 30 or 40 feet from the barn. They ate any kind of green vegetation—potato tops, peach tree leaves, garden weeds of any and all kinds, gooseberry leaves; in fact, apparently any and all kinds of green vegetation except death-weed. The larvæ have very much the appearance of the ordinary cutworm in the earlier stages of its growth, but it grows to be larger and much longer than the ordinary cutworm, and in the latter stages of the larval growth is of a light green color. Many of the larvæ attain a length of at least two inches, and some a length of probably as much as two and one-half inches. These larvæ while in my garden worked at night—i.e., during the darkness. Looking in the daytime, it was remarkable to find in sight even one larva, but they could be found in abundance in the ground about one inch from the surface. The domestic hen and the ordinary blackbird are very fond of both the larvæ and of the butterfly. The larvæ have destroyed quite an amount of alfalfa that was to be cut for seed, and also some alfalfa that would have been a second cutting

for hay. A U.S. forest ranger told me this morning that the first damage he noticed from the larvæ in the forest was the leaves that were eaten from the Snow Brush, in many places the leaves being entirely stripped, eaten off,—i.e. consumed. Yesterday I saw many of these butterflies flitting among the branches and above the tops of the tall pine trees. Sunday, the 20th, I saw millions of these butterflies coming from the direction of the timber and flying on in the direction of Goose Lake. In other words, they were flying just about due west, and at the time there was quite a stiff, constant north wind blowing. These butterflies seem to congregate and alight on the willows, green-growing alfalfa, and in wet, muddy places. At other times—at least, during the day time—they are mostly on the wing. Now, the larvæ haven't done any remarkably great amount of damage yet, but there are butterflies in sufficient numbers now to produce a crop of larvæ next year to entirely destroy all the vegetation that would be produced here next year—i.e., if they are of the kind that comes every year."

Under date of June 12, 1912, Mr. Louis R. Webb, of Waldo, Oregon, wrote us of the appearance there of these caterpillars as follows: "There has appeared in this section of Josephine County a sort of army worm that resembles somewhat the caterpillar, and different from anything I ever saw. It has attacked the grease wood and mountain lilac mostly, and there are many acres in this locality and South River County, Del Norte County, Cal., that have been completely stripped of their foliage, and it has begun to attack fruit trees. It builds no web like the army worm of previous years, and its colour is black, with light streaks along its back. The worm at present is about an inch long and about one-eighth of an inch in diameter. So far, I have failed to find the moth that deposits the eggs."

"Also, under date of July 4, same year, specimens of the larvæ were submitted, and we quote from this letter as follows: "I wish I could send you photos of vegetation destroyed by these caterpillars. When they had eaten all the foliage off grease wood and mountain lilac, they started a sort of exodus and took possession of everything—even our homes could not exclude them. The streams and river were black with them, and tons of them

went down the Illinois River, tons of them starved to death, and the brush and trees are covered now with their pupas like the enclosed. They seemed to care for nothing to speak of but greasewood and lilac, but did eat some on willows, ferns, currant bushes, and very few young apples were gnawed by them like the sample enclosed. I think the enclosed samples will tell you a true story of what they did."

He also wrote us farther, under date of July 23—this time including pupæ of the insect and also specimens of some parasites. The butterfly accompanying this letter was determined by Dr. Dyar as belonging to the species under consideration. The hymenopterous parasites accompanying this letter were determined by Mr. Viereck as *Theronia americana*; while the supposed dipterous parasite was determined by Mr. Walton as *Helicobia helicis*. This latter was more likely to have been a scavenger than a parasite, although both species were reared from material submitted. In this letter Mr. Webb states that the butterflies seem to migrate after they emerged, and that fully half of the chrysalids were destroyed by parasites.

## NEW LIFE-HISTORIES IN PAPAIPEMA SM. (LEPID.)

BY HENRY BIRD, RYE, N. Y.

(Continued from Vol. XLIII., p. 47.)

*Papaipema moeseri* Bird

The larval history accords with the usual routine experienced in *Papaipema*. As it is such a distinct species and so well distributed and accessible when the facts are known, it may be excusable to give some details of its discovery. The root-boring habit of the larva, its superficial resemblance to *P. impecuniosa* Grt., and the fact of its often occurring in the same locality, though in a different food plant, served, through a peculiar chain of circumstances, to retard its apprehension for several years at least.

The first intimation of the species came from Mr. A. F. Winn, of Montreal, whose query as to what *Papaipema* was boring *Chelone glabra*, Turtle-head, had to go unanswered. None of the few plants occurring about Rye gave evidence of being bored, and Mr. Winn was advised to look into the question another year, for we were

glad to delegate the matter to such able hands. In due course, the next season, he reported finding a freshly emerged moth of *P. impecuniosa* crawling up the stem of a *Chelone* plant when he was examining it to find the pupa of its borer, and naturally concluded he had found a new food plant for the Grote species.

The following year the writer was at Montreal in mid-July, and happened upon a large colony of Turtle-head borers, working, as it chanced, in a damp area where *Aster puniceus* was flourishing plentifully. The Aster was being bored by numerous *impecuniosa* larvæ, whose identity was beyond question, and a careful comparison of them with the larvæ from the Turtle-head failed to note the slightest difference It was conceded Mr. Winn was doubtless correct in his surmise—a mere case of substitution of foodplants was occurring. Larvæ were then in the fourth stage, and, knowing the trouble it would be to carry them through, the Montreal colony were in no way depleted by accessions in my behalf.

About this time the *Papaipema* investigations of Mr. F. E. Moeser, at Buffalo, prompted a recurrence of the question, what species bores Turtle-head ? And the writer replied with considerable assurance that it was without doubt *impecuniosa*. But when later in the season Mr. Moeser went to get the pupæ from the borings, as can be readily done with the normal workings of the species in Aster, he found they had pupated elsewhere. Even then we were not convinced, for it was recalled when working in *Helenium*, *impecuniosa* usually forsakes its gallery to change. The next year Mr. Moeser decides to settle the matter to his own satisfaction, and scores the breeding of a new species. My own dull eyes had by this time seen a mature larva and had awakened to a relization it could not be the Grote species.

The stations for *moeseri*, doubtless, long endure. Turtle-head is a tenacious perennial in those wet locations that are congenial, and indications point to the well-established colonies existing many years at a given spot. Such a one on Staten Island, N.Y., is called to our attention. Here, almost in sight of the former home of the late A. R. Grote, a woodland rill meanders through the undergrowth, edged with a fringe of *Chelone* that takes root in its very bed. This station for the plant has long been a botanical record for Mr. W. T. Davis, and under his guidance

in July, 1911, the place is visited to see if *moeseri* can be found there. Numerous larvæ are located, and in 1912 the colony is found to be still flourishing. There is considerable difference apparently in the time at which the hibernated ova hatch, due to the very moist conditions they endure. While the egg may withstand inundation very well, the young larvæ cannot, and, as with *marginidens* working in *Cicuta* and *Sium*, both water-loving plants, many tardy larvæ occur. Though neither the ova nor the first stages were observed, the first week of June can be figured as their date of general emergence. The stems are entered several inches above ground, and a more or less extended tunnel drilled upward. As they become larger, the boring of necessity becomes small for them, and they turn downward in the underground portion of the stem or root. The stems are often weakened so as to fall, and there are several openings made whereby the frass is thrown out. These castings form in little whitish mounds and become a conspicuous clue to the hidden host. Thus far, parasitism seems abnormally low, but one *Hemiteles* attack having been noticed.

As *moeseri* is so clearly a denizen of the wild woodland or swamp, it seems a coincidence to have been first met within the confines or immediate vicinity of such large cities as Montreal, Buffalo or New York. In southern West Chester Co., N.Y., and on the opposite shore of Long Island no infestations have been found, though it is true no stations of the plant were met that could be expected to support flourishing colonies. The following larval stages were observed:

Stage IV.—Head normal for group, polished, pale brown, marked with a black line at the ocelli, which extends posteriorly oblique across the epicranium, labrum and mouth parts black, seta at tubercle VIII seems longest. Body cylindrical, thoracic joints have the skin puckered, colour is a livid cast of umber brown, which shows on joints four to seven inclusive as a dark band or girdle, the remaining joints relieved by the white longitudinal lines; the dorsal line is unbroken, but its continuation across four to seven is by the merest thread; subdorsal line wider, but breaks abruptly at joints four to seven; subspiracular shows on thoracic joints, on eight to twelve is fused with the white of the ventral

area. Tubercles well shown, brownish black; on joint one the cephalic plate forms a complete covering dorsally, being wider than the head, of similar texture, and edged at the side with black; on joint two an elongate plate occurs anterior to Ia and Ib, the fusion of Xa and Xb apparently, and is about twice the length of a spiracle; Ia, Ib and IIa show as mere dots; IIb, III and IV are much larger, being greater than a spiracle; VII of similar size; on joint three tubercles similar, except the elongate plate is absent; on the abdominal joints IV slightly exceeds the spiracle, and on ten is low down; on joint eleven III and IIIa are well separated, and I and II assume their usual large proportions; anal plates well developed; spiracles black.

Stage V.—Similar; on joint ten there is indication of tubercle IVa, but it is not stable for this nor succeeding stages.

Stage VI.—Body colour much lighter; otherwise no change.

Stage VII.—Head has lost oblique lateral marking, body colour fades to whitish translucence at maturity; the fused tubercle Xa and Xb is less prominent; otherwise similar. Larva measures 21, 27, 35, 40 mm. for the stages respectively.

Maturity is reached August 8th to 15th, and the gallery is left for pupation. The pupa is shorter and chunkier than usual, of chestnut brown colour and shows no unusual developments; the cremaster is two sharp, curved hooks; length, 15 to 16 mm.

The emergence dates for thirty specimens include August 26th to September 19th.

*Moeseri* larvæ in early stages are almost identical with *impecuniosa*, in the last two stages its larger size and middle girth, together with a slight difference of tubercle delineation, readily separate them.

*Papaipema stenocelis* Dyar.

This species, represented by a unique type from Baltimore, Md., was described in 1907. A second specimen was taken at light at Lakehurst, N.J., by Mr. O. Buchholz, in September, 1910. A relationship is apparent to *P. inquaesita* G & R., and more closely still to *speciosissima* G & R.

It seemed clear that so distinctive a species must have remote haunts and be restricted to a more southern range, else collectors would have cognizance of it long ago. Believing this second capture had bred at Lakehurst, since the habits of this group controvert an assumption of migration, to which the appearance of many late-flying, southern Noctuids is often assigned, led the writer to make an extended search for its larva in the pine barren flora of Lakehurst, in 1911.

The results were negative, and subsequent studies of lists of more southern flora, gave little intimation what particular plant was likely to shelter the *stenocelis* larval tunnel in its stem or root. The larger perennials, with which we are wont to associate these borers, are strikingly absent from pine barrens, and we finally conceived the notion it must bore some fern.

On July 28, 1912, we again invaded the Lakehurst region, with the idea of investigating the unfamiliar ferns, and in a half hour's time had discovered the desideratum. Some orange-coloured frass, similar, yet a little different from that thrown out by *inquaesita* when in the root of *Onoclea*, was noticed about the stipes of *Woodwardia virginica*, and gave intimation that this was the species of which we were in search. Upon uncovering the larva, which was working in the long running rootstock, we became more certain of the determination, as it transpires the tubercles on joint eleven accords with the unique departure shown in *inquaesita*, except that it is more pronounced. Confirmation of the matter occurs on September 13, following, when the first beautiful male moth appears.

The life cycle clearly follows the usual course, the hibernated ova placed in September hatch forth about the first week of June. The normal larval period will likely cover sixty to sixty-five days, and the pupal condition lasts about thirty days.

The newly emerged larva enters the stipe near the base and works down to the running rootstock, where it finds an ample opportunity to mine an extended burrow. Communication with the original entrance is discontinued after a while, and more convenient openings for disposing the frass are made as the tunnel progresses. An Hemiteles parasite, which hibernated in its

cocoon, had claimed 85% of the larvæ encountered. Larvæ were observed in the following stages.

Stage V.—The general features as given for the preceding species apply. The colour is a warm shade of brown, the longitudinal lines are narrow and not so contrastingly white, the dorsal alone continuous. On joint eleven tubercles III and IIIa are fused into a plate about three times the size of the spiracle, IIIa occurs distinctly on the preceding abdominal joints; on joint twelve the plates are stronger than with the compared form.

Stage VI.—Little change, colour paler and more of a sienna tint, tubercles appear with better prominence.

Stage VII.—General characteristics normal; colour a pale, dull, pinkish hue, fading to translucence at the sutures; lines indistinct; the blackish tubercles stand out in greater prominence, of the lateral ones, III on joint two, and the fused III and IIIa on joint eleven are most conspicuous, the latter constituting the chief specific character. This plate is four or five times the size of the spiracle. Setæ are so weak as to be unnoticeable without a lens. The first pair of prolegs on joint six are aborted in early stages, and never develop so fully as the succeeding three pairs; crochets here number twelve, while for joint nine the number is eighteen. Larval length, 30, 38, 46 mm., for the stages respectively.

A feature of individuality with *stenocelis* is the prominence of tubercle III on joint eleven, which has evidently taken in IIIa. While these plates often coalesce in other species of the genus, there is not the comparative enlargement as in this case. *Cerussata* and *cataphracta* are examples of large tubercle development, III and IIIa fuse, in this instance, into a large plate with them. But it does not reach the proportions attained in *stenocelis*. With *inquaesita* this plate is of unusual size, since the remaining tubercles are so very weak. Tubercle IIIa on the abdominal joints of Noctuid larvæ seems always obscure and generally wanting, especially is this so on joint eleven. With such a well tubercled larva as that of *Achatodes zeae*, IIIa seems normally wanting on

joint eleven, though it occurs conspicuously on the preceding joints. One specimen was observed that had it on joint eleven, but it occurred on one side only.

When ready to pupate, the larva leaves the burrow and changes in the ground. The pupa is of normal appearance, and the period is of usual duration—about a month.

*Stenocelis* was placed in *Hydroecia* by Dr. Dyar, his type being imperfect in the characteristic tufting that is a feature in differentiating these moths. It is a conventional *Papaipema*, however, and was so referred by Hampson, perfect material having the typical tufting present, while the genitalia conform to the unusual pattern of this group. What is really a better characteristic exists in the larval appearance which accords with the unique pattern disclosed in *Papaipema*—at least, as occurs with thirty of the species whose larvæ are known. One very notable departure happens with *frigida*, whose larva approximates *Hydroecia* characteristics, and is evidently a relic of the stem species, whence both these groups sprung.

The genitalia have not been discussed. These male characters show little to distinguish them from the general type. The broad, heavy side-piece, or clasp is tipped with an irregularly formed cucullus, shaped somewhat like a foot with an over-developed heel, and having the toe, which is the anal angle of the corona, pointing ventrally. This area is set with spine-like setæ that point anteriorly. The harpe is a stout, sharp-pointed hook, curved like a cow's horn. It is shorter than with most species, and is toothed slightly on the outer edge. These teeth, too, are of less prominence. The clavus is marked only by a slight prominence, which is covered with fine setæ. The uncus is the usual finger-like appendage, widened a little near the point.

From our studies of southern flora, now that the food-plant is known, we might predict *stenocelis* may find its principal metropolis in the Dismal Swamp region of Virginia, where Woodwardia reaches a prolific development.

## BOOK NOTICES

A Contribution to the Morphology and Biology of Insect Galls. By A. Cosens. (Reprinted from the Transactions of the Canadian Institute, Vol. IX., pp. 297-387, 13 pls., 1912.)

That aspect of cecidology which treats of the causes that are operative in the formation of insect galls and the manner in which the plant tissues react to the stimulus is one that has been much neglected, particularly by American students of the subject. Mr. Cosens' work throws considerable light on these interesting problems and is one of the most important contributions to our knowledge of the morphology of galls that has ever been published.

The greater part of the work is devoted to descriptions of the anatomy of sixty-eight kinds of American insect and phytoptid galls. The descriptions are arranged in the order in which the producers are classified, most of the gall-producing families, except those of the Coleoptera, being represented.

Although dealing mainly with matters that are chiefly of interest to the botanist, the author has also cleared up some important difficulties concerning the feeding habits of various gall-producing insects. Cynipid larvæ were found to secrete an enzyme which converts the starch in the nutritive layer of cells surrounding the larval chamber into sugar, which is taken up by the larva through the mouth. The cells of the larval chamber thus remain unbroken, and their inner surfaces present a marked contrast to the ragged cell-layer lining the cavities inhabited by inquiline larvæ. This view is confirmed by the discovery that though, contrary to current views, the intestinal tract in Cynipid larvæ is complete, an anus being present, no frass is expelled, as would be the case were the entire cells devoured, as they are in sawfly galls.

It is suggested that this ferment "may indirectly stimulate cell proliferation by storing the nutritive zone with an unusually large quantity of available nourishment, which can diffuse to all parts of the gall."

Adler's discovery that the gall of *Nematus vallisnierii* is partly formed while the larva is still within the egg, was confirmed in

the case of several species of Pontania. It is suggested that the curious power of the excrement of such sawfly larvæ to induce cell proliferation is possibly due to their having swallowed tissues still containing these enzymes, which have retained their stimulating power, even after having passed through the intestinal tract of the larva.

The work, which should be in the hands of every student of insect galls, is beautifully illustrated by thirteen heliotype plates from photomicrographs of sections of the various galls described in the text. There are also a few good text figures.

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Contributions to the Natural History of the Lepidoptera of North America. Parts IV., V. and VI. By Dr. Wm. Barnes and Dr. J. H. McDunnough.

Three more parts of this valuable publication, by Dr. Barnes and Dr. McDunnough, have appeared, bearing dates of July, 1912. Part IV. is entitled, "Illustrations of Rare and Typical Lepidoptera," and contains 27 plates, reproduced by half-tone process from photographs, which present in all 506 figures. Most of these are of moths which have not previously been figured, and a large percentage are the actual types, so the usefulness of the work to students will be realized. The text, 54 pages, and index is mostly an explanation of the figures, with locality of the specimens shown, but in some cases additional notes are given.

Part V.—"Fifty New Species: Notes on the Genus Alpheias" —contains 44 pages of text, three half-tone plates showing 62 figures of types and cotypes of the species described, one plate of genitalia and one of venation. The new species are from Arizona, California, New Mexico, Texas and Utah.

Part VI. is of 13 pages "On the Generic Types of N.A. Diurnal Lepidoptera," and deals with one of the many phases of the vexatious muddles which entomological nomenclature, at present, is in, but it seems probable that the International Congress of Entomology will be able before long to overcome many of the difficulties that make it so easy to keep generic and specific names in a constant state of chaos. A. F. Winn.

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# FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 98.)

369. *Pyrrhia exprimens* Walk.—I have compared this form with Walker's type from Orillia, Ontario, and consider it correctly named. *Angulata* Grote, from Buffalo, N.Y., is the same species. It is the one with almost blackish central shade and t.p. line, and blackish bordered secondaries. It stands wrongly in Dyar's Catalogue as a variety of *umbra* Hufn., a European species which should be struck out from our lists altogether, and place given to *cilisca* Guen. I have not, as a matter of fact, seen the type of *cilisca*, but Sir George Hampson has, and gives the locality as "Brazil" in the Catalogue. It is in Mons. Oberthiir's collection at Rennes. In the British Museum is a Kansas specimen from the Snow collection, marked "*cilisca* Guen," which I must assume has been compared with this type. This is the species figured by Holland as *umbra* Hufn., and is the *umbra* in error of all North American authors.

In *cilisca* the primaries have a crimson irroration which seems to be lacking in *exprimens*. The cross lines are finer and not blackish, and the central shade is less acutely angled in the cell. The secondaries are crimson-bordered, and not blackish. All my specimens of *cilisca* are from the Eastern States, and I have both this and *exprimens* from Milwaukee Co., Wisconsin. Both seem to occur all across the continent in the south, but I have not yet seen *cilisca* from Western Canada.

The European *umbra* combines some of the characters of the two, but I carefully examined the British Museum material, and all the British literature and figures in my possession, and it seems to me to be easily separable from both. It has the dark-bordered secondaries more like *exprimens* than *cilisca*, but the transverse lines are like those of the latter, though it usually lacks the pink irroration. I happen to have but a single example of *umbra* in

my own European collection, so I am unable to make further comparisons at present. Sir George Hampson unites them all as one species, under *umbra*, citing:

Ab. 1. *exprimens*.—Fore wing with the postmedial and terminal areas suffused with brown.—Canada and U.S.A.

Ab. 2. *cilisca*.—Hind wing paler yellow, the postmedial band pale crimson.—U.S.A. and Brazil.

373. *Cosmia decolor* Walk. (not *discolor*).—The type is a rather dark, smoky-suffused orange male from Orillia, Ontario, and is probably the one figured by Hampson, but the black streak shown near the inner margin is presumably an artist's error. *Discolor* of our lists was merely a mis-spelling, and the name unfortunately should stand as a synonym.

374. *C. infumata* Grt. = *punctirena* Smith.—Grote's type, a female from Malawqua Co. (?Chautauqua), New York, is a very dark fuscous-brown specimen. Of *punctirena* I have seen two types, male and female, from Yellowstone Park, Wyoming, in the Washington Museum. There is no type there from Cartwright as I previously stated. The types are a trifle reddish, even, and have the t.a. line angled rather than curved, but are certainly the same as *infumata*, and my tentative synonymy of this and *decolor* has proved correct. Sir George Hampson correctly keeps European *paleacea* distinct, but fails to recognize two North American species. I do not blame him. I have no modification to make of my former notes, and nothing to add, but I must admit that I should probably never have suspected, or, at any rate, been able to separate the two species if I had not had the opportunity of studying them in nature. As it is, I cannot always place specimens with certainty.

Hampson places them in the genus *Enargia* Hubn., and, as is his rule, changes the gender of the specific name to concord with that of the genus, thus making the name *decolora* Walk. He makes *infumata* ab.1. "Head, thorax and fore wing thickly irrorated with fuscous." "Ab. 2. Fore wing yellowish white, with slight dark irroration." This is a male from Lower Klamath River, California, and is a very pale whitish *decolor*. I have seen other similar specimens, and Dr. Barnes has such a female from Victoria, B. C., bearing a manuscript name. "Ab. 3. Fore wing pale yellow,

irrorated with red, the markings reddish." This specimen, from New York, is *decolor* also, and I have similar ones in my collection.

375. *Orthosia verberata* Smith.—I am perfectly satisfied as to the distinctness of this species from *ferrugineoides*. To my former notes I would add that this species generally has a more or less distinct claviform, which *ferrugineoides* lacks. I have both species from both Cartwright and Miniota, Manitoba. *Verberata* occurs at Kaslo, and on Vancouver Island, but I have not yet seen *ferrugineoides* fom west of the Rockies in Canada, though Hampson lists a specimen from Glenwood Springs, Colo. European *circellaris* Hufn., (*ferruginea* Schiff.) falls, as Hampson correctly places it, between the two. I have eleven British specimens, and have examined more at the British Museum. With a few of the specimens alone I should never have thought of separating it from *ferrugineoides*, and the secondaries in all are more evenly dark, with slightly darker veins and pale costal region, thus resembling *verberata*. There are vague traces of a claviform in a few specimens. In most the general coloration is nearest that of *verberata*—viz., interspersed with varying shades of brown and rufous. The transverse lines are more distinct than is generally the case in *ferrugineoides*, but less so than in *verberata*. Hampson finds that *verberata* has the frons black at sides, and separates it from the other two in the tables by this character. Brown, perhaps, describes it better, but the character is by no means an obvious one, some of my *verberata* having frons scarcely brown at sides at all, whereas some *circellaris* distinctly have.

It is interesting to note that in the present paper there are presented three instances in which a European species has two apparently distinct North American representatives.

| European | N. American |
|---|---|
| *circellaris* Hufn. | *ferrugineoides* Guen. and *verberata* Smith. |
| *paleacea* Esp. | *decolor* Walk. and *infumata* Grt. |
| *umbra* Hufn. | *cilisca* Guen. and *exprimens* Walk. |

In two of these cases, however, I appear at present to be unsupported by other opinions.

376. *O. euroa* G. and R.—Grote changed the name to *puta*, to which Sir George Hampson gives preference. The two names therefore apply to the same type, but I have not discovered where that type is to be found. Presumably it ought to be in the collection of the American Entomological Society at Philadelphia. Smith described *dusca* in Ann. N. Y. Acad. Sci., xviii., 117, Jan. 1908, from Cartwright, Miniota and Winnipeg, Man., and Kaslo, B.C. I have seen a male and female type from Brandon and Miniota, and the type labels bear this name. But in an earlier paper (Trans. Am. Ent. Soc., xxxiii., pp. 350, 360), he makes reference to the form as *duscata*. Compared with *euroa*, it was stated to be "smaller, darker, with more diffuse maculation, and with shorter, broader primaries." Genitalic differences were referred to in the "Transactions." Calgary specimens do not differ from those from Manitoba, and Smith would obviously have called them *dusca*. As a whole, the species is perhaps usually smaller and darker in the west, but not constantly so, and I can see no reason whatsoever for treating the western form as distinct, and must refer *dusca* to the synonymy. Dr. Barnes told me some time ago that he was of the same opinion.

377. *Agroperina lineosa* Smith. (Journ. N. Y. Ent. Soc., xviii, 145, Sept. 1910).—Described from thirty specimens from Calgary and several Manitoba points. *Pendina* Smith, described as a species from the same localities in the same paper, is unquestionably a variety of the same thing, and is almost that form I referred to as "dark crimson." I have such an extreme form, but "deep luteous red-brown," as Smith describes it, is a more common variation and this is the "*morna*, ab. 2, deep rufous," of Hampson's Catalogue, vii., 405, his "ab. 1" being a pale rufous form, intermediate between the more common luteous *lineosa* and var. *pendina*. The actual specimen figured by Hampson as *morna*, from Yellowstone Park, Wyoming, is of the pale uniform, slightly marked form described by Smith in the same paper, also as a species, as *indela*, from various localities in Wyoming, Idaho, Colorado, Montana and Washington. The *morna* of Strecker, as I have pointed out under my No. 155 (xliii, 230, July, 1911), is not allied to this group at all. By Smith's own admission, *indela* and *lineosa* were very difficult to separate, and from the material I studied in his collec-

tion and elsewhere, it never occurred to me that two species existed at all. But as I happen to possess no specimens from any of the localities given for *indela*, I must give the form the benefit of the doubt, whilst expressing the belief that all the above names, with the exception, of course, of *morna* Streck., are probably only forms of *conradi*, which both Hampson and Smith claim to have from Calgary, and Smith also from Winnipeg. The type of *conradi* is a female in the British Museum, from Colorado, and is, as Grote describes it, "faded ocher brown, . . . the darker specimens having base and subterminal space a little paler, . . . s.t. line preceded by a diffuse darker shade." *Citima* Grote, type a female from Arizona, in the Neumœgen collection at Brooklyn, is like it, but darker and more strongly marked. It is correctly referred as a synonym by Hampson, and Smith accepted the reference. Hampson separated *conradi* from his "*morna*" in the tables by the pale s.t. area. Smith adds, "a rough powdery appearance." Both these characters hold in my only southern specimen, from Las Vegas Range, New Mexico, which I labelled as *conradi* after comparison in the British Museum. Some of the more strongly marked and contrasting Calgary specimens have been cited as *conradi* by both Sir George Hampson and Smith. I have no fault to find with that, except to say that none that I have yet seen from here are quite like the types of either *conradi* or *citima*. But I have entirely failed, after repeated attempts extending over twenty years, to recognize two species amongst my local material, either on treacled posts, flying round a lamp, feeding on flowers, or in the collection. Smith claimed genitalic differences for most of the above named forms, though admitting that they were so slight as to be scarcely noticeable.

*Belangeri* Morr., found locally in the Province of Quebec, is most suspiciously like a rather suffused fuscous race of *conradi*. I am indebted to Mr. Winn for a nice series, and am able to match more than one of the specimens almost exactly with some of my local *lineosa*. The type is probably in the Tepper collection, but I do not know its origin. Sir George Hampson makes it a synonym of *inficita* Walk., apparently correctly, though that is an unusually even red specimen. It is the specimen figured fairly well, but is a male, not a female. It was described from an unknown locality.

*Agroperina* is a new generic name used by Sir George Hampson for the foregoing group, and a few other species hitherto standing with *Orthosia*.

(To be continued.)

## ENTOMOLOGICAL SOCIETY OF ONTARIO.—FIFTIETH ANNIVERSARY

At the regular meeting of the Society, held on Friday, March 14th, it was decided to hold the Annual Meeting of the Entomological Society of Ontario and the celebration of the 50th anniversary of its formation at the Ontario Agricultural College, Guelph, on Wednesday, Thursday and Friday, August 27th, 28th and 29th. A committee to make all necessary arrangements was appointed, consisting of the following: Professors Bethune, Howitt and Jarvis, and Messrs. Caesar, Baker and Spencer, of Guelph; Dr. E. M. Walker and Mr. A. Cosens, of Toronto; Dr. C. Gordon Hewitt and Mr. Arthur Gibson, of Ottawa, and Messrs. H. H. Lyman and A. F. Winn, of Montreal, with power to add to their number.

As the time of the meeting will be during the first week of the Toronto Exhibition, reduced railway rates will be available as far as that city. The committee will welcome suggestions from any of the members of the Society regarding the best methods of carrying out this celebration.

At a previous meeting a resolution was adopted expressing sympathy with the Royal Geographical Society of London, England, in the loss sustained by them and by the scientific world in general through the death from cold and exhaustion of Captain Scott and his brave companions.

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The habitat of *Rhogas indicus* Cam.—In Wien.Ent. Zeit., 1910, p. 3, Cameron has described a new species under the above name, giving as habitat "Sitka on the Ganges (Mannerh?)" There may possibly be some locality Sitka on the Ganges river, but "Mannerh" is apparently an abbreviation of Mannerheim, who possessed many insects from Sitka in Alaska, and this is, I think, certainly the true habitat of the species.

E. Bergroth.

## ROBBER-FLY AND TIGER-BEETLE.

On August 21st, 1909, while walking across a young orchard in Peachland, B. C., I flushed a tiger-beetle which flew a few yards. Seeing that it was of a species new to me, I promptly followed it.

Again it flew, but was at once pounced upon by a large robber-fly, *Proctacanthus milberti* Macq., which had been poised on a weed near by.

As the fly flew heavily away with its prey, I netted both. The robber refused to be parted from its dinner, and both were put in the cyanide bottle. Although but a few seconds had elapsed from the seizing of the tiger by its enemy, the poor thing was quite dead, the robber's proboscis having pierced its body exactly between the elytra and about one-quarter of the length of the body from its base.

The beetle proved to be *Cicindela purpurea*, and, strange to say, is the only one I have seen during three visits, each of several weeks, to the valley.

J. B. Wallis.

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## NOTES ON THE DEATH FEINT OF CALANDRA ORYZÆ LINN.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

In the course of some fumigation work against this insect, which is the common widely distributed "rice weevil," it was noticed that the duration of its death feint was exceedingly brief —so brief, in fact, as to cause one to wonder of just what value such a brief feint was to the weevil. The duration of each feint was ascertained in a number of weevils, and the following table gives the length of time in seconds of the first twenty-five feints in six different weevils. The temperature during these operations was 75°F., and the feint was induced by blowing upon the insect's ventral side or by dropping it through the space of one inch. When dropped from a height of six or eight inches, or more, no feint was produced, the weevils in all cases becoming immediately active.

Duration in seconds of first 25 death feints in 6 weevils

| A | B | C | D | E | F |
|---|---|---|---|---|---|
| 3 | 1 | 1 | 1 | 5 | 15 |
| 1 | 8 | 1 | 3 | 5 | 13 |
| 1 | 5 | 3 | 5 | 7 | 15 |
| 8 | 5 | 1 | 1 | 10 | 12 |
| 1 | 4 | 1 | 2 | 2 | 3 |
| 20 | 7 | 4 | 5 | 4 | 3 |
| 1 | 7 | 8 | 5 | 2 | 5 |
| 10 | 5 | 7 | 7 | 2 | 7 |
| 20 | 10 | 5 | 5 | 2 | 8 |
| 25 | 10 | 2 | 5 | 10 | 3 |
| 1 | 7 | 5 | 8 | 3 | 2 |
| 3 | 17 | 2 | 9 | 4 | 1 |
| 1 | 7 | 10 | 2 | 3 | 1 |
| 1 | 7 | 1 | 1 | 1 | 1 |
| 8 | 3 | 8 | 1 | 5 | 10 |
| 15 | 5 | 13 | 1 | 3 | 2 |
| 20 | 3 | 7 | 2 | 1 | 4 |
| 10 | 2 | 8 | 7 | 1 | 1 |
| 23 | 1 | 15 | 5 | 2 | 1 |
| 1 | 7 | 3 | 5 | 8 | 3 |
| 5 | 10 | 2 | 1 | 4 | 2 |
| 5 | 13 | 1 | 3 | 2 | 1 |
| 1 | 17 | 8 | 2 | 6 | 8 |
| 13 | 18 | 2 | 10 | 8 | 2 |
| 10 | 8 | 2 | 5 | 1 | 6 |
| Averages .. 8.2 | 7.4 | 4.8 | 4.0 | 4.0 | 5.1 |

From these figures one can see what a wide variation in duration occurs in different individuals, and even in one individual. Twenty-five seconds was the longest feint, and the average ran

from four to eight seconds. Thirty-five was the highest number of successive feints it was possible to produce in one individual. After the thirty-fifth, they became only partial—that is, one or two of the legs would stick out from the body as if fatigued.

During every feint the insect was placed on its dorsum, as only in this manner was a successful fe'nt produced. When the insect was placed on its ventral side in almost evey case, the feint would last only a second. On account of the shortness of the feint, it was almost impossible to try the effect of gases, etc. Upon subjecting individuals feigning death to the fumes of carbon bisulphide and chloroform, they instantly became active. Upon placing other feigning weevils upon blocks of ice, they slowly assumed the death attitude, the femurs taking a position at right angles to the body, with the tibiæ and tarsæ loosely folded upon each other—all tending somewhat to bunch together. Individuals starved to death assumed a similar attitude.

The death feigning attitude is quite unlike that of death. The distal ends of the femurs of the first pair of legs extend forward, being pressed against the base of the snout. The femurs of the second pair of legs also extend forward, and are held close to the body. The third pair assume a position similar to the second, except that the distal ends point toward the posterior end of the body. The femur, tibia and tarsus are in all cases folded upon each other and drawn close to the body, while the antennæ take a position parallel to and close against the snout. The entire attitude, however, does not seem to be as rigid as that assumed in the death feint of the plum curculio, but is apparently easily and instantly relaxed.

The value of this brief death feint to the weevil is hardly apparent. Probably on account of its somewhat concealed method of feeding, it has little occasion to feign death, and as a result the duration is correspondingly short.

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## ERRATA.

Page 2, line 31.—For narrower, read narrow.
Page 3, line 12.—For Manse, read Manee.
Page 7, line 23.—For ♂, read ♂ ♀
Page 9, line 3.—For *annulicomis*, read *annulicornis*.

## ON SEVERAL NEW GENERA AND SPECIES OF AUSTRALIAN HYMENOPTERA CHALCIDOIDEA.

BY A. A. GIRAULT, BRISBANE, AUSTRALIA

(Continued from page 106.)

Tribe Haltichellini.

Genus *Stomatoceras* Kirby.

1. *Stomatoceras victoria* new species.

*Female:* Length, 4.25 mm.

Black, somewhat shining; tegulæ, legs and basal half of abdomen ventrad (also latero-proximad), red, on the abdomen the reddish mixed with yellowish; scape (rest of antenna missing) black; fore wing with a smoky fascia across it at the stigmal vein (accented at the vein) and a rounded smoky spot farther distad nearer the costal wing margin and about half way to the wing apex from the stigmal vein, otherwise both wings hyaline.

Body rather finely rugoso-punctate, the spaces between the punctures smooth; lateral ocelli their own diameter from the eye margin or slightly more; scutellum terminating in two tooth-like plates, one on each side of the meson; abdomen finely reticulated; propodeum in the middle of the dorso-lateral aspect, with one distinct plate-like projection, another broader one indicated cephalad of it. Propodeum punctured like the rest of the thorax. Scape very long, bent at extreme tip, reaching to the cephalic ocellus, which is at the apex of the channel-like scrobicular cavity. Body finely pubescent. Posterior femur without a large tooth ventrad, its ventral margin straight but pubescent and along the distal two-thirds armed with a uniform series of minute, black, comblike teeth. Stylus of abdomen short. Postmarginal vein long.

(From a single specimen, the same magnification.)

*Male:* Unknown.

Described from a single card-mounted female specimen, labelled "*Cheltenham*, Victoria."

*Habitat:* Australia—Cheltenham, Victoria.

*Type:* No. *Hy 1185*, Queensland Museum, Brisbane, the above specimen; a fore wing and an antenna on a slide.

This species closely resembles *S. fasciatipennis* Bingham (1906), described from North Queensland and should be compared

with it. However, the second abdominal segment is plainly shorter than the remainder of the abdomen.

Later, among a small collection of *Chalcidoidea* given to me by Mr. F. P. Dodd, I found a species of Stomatoceras which agrees with the description of *S. fasciatipennis* Bingham. Also, it was mounted on a card containing a flat lepidopterous cocoon, in general outline shaped like a spool, from which projected an empty pupal case and also a number of small ants. This card was labelled "Townsville, Qld., 20, 5, 02. F. P. Dodd." Thus, this specimen (a female) is from the type locality of the Binghamian species, agrees with the description and appears to be a part of the same material, since its insect associates agree with those denoted by Bingham. Comparing this specimen (which I have identified as *fasciatipennis* and deposited in the Queensland Museum at Brisbane) with *victoria*, the difference between them becomes more apparent, since in the former the marginal vein is plainly longer and both the subfascia distinctly larger, especially the distal one, which extends distad half way to the apex. Also, the second abdominal segment is somewhat longer in *fasciatipennis*, the third and following segments short, but (segments 3–5) nearly twice the length of the corresponding segments in *victoria*. Otherwise, the two are much alike. A balsam slide bearing an antenna and a posterior leg goes with the cardmount.

2. *Stomatoceras hackeri* new species.

*Female:* Length, 4.50 mm.

The same as the preceding species (*victoria*), but the scape is also dark red, including also the long pedicel and the first two funicle joints (and a part of the third); the abdomen is reddish, only along the median line of the venter; the fore wings have the same general pattern (as regards fuscation), but they are more irregularly fumated, the two fumated areas less distinctly separated, especially caudad. The posterior femora beneath are toothed less farther proximad and the apical emargination (a convexity) is more pronounced (this crenulation of the margin should not be confused with the first tooth in the family which is usually large); also from between the fine black teeth arise series of solitary, erect, stiff, but short bristles. The postmarginal vein is long.

(From a single specimen, the same magnification.)

*Male:* Not known.

Described from a single female specimen, minutien-mounted, from the collections of the Queensland Museum, Brisbane, labelled "Brisbane.—H. Hacker.—8-8-11."

*Habitat:* Australia—Brisbane, Queensland.

*Type:* No. *Hy 1187*, Queensland Museum, Brisbane, the above specimen, minutien (abdomen separated), plus a slide bearing a fore wing and antennæ.

*Stomatoceroides* new genus.

*Female:* Similar to *Stomatoceras* Kirby, but the postmarginal vein well developed, longer than the short marginal vein, four times the length of the stigmal and slender. Antennæ 11-jointed, inserted below the ventral ends of the eyes, the club solid, only slightly shorter than the long proximal funicle joint (a third shorter), the scape simple, long, the pedicel short, the flagellum cylindrical and a single ring joint present. Posterior femora without large teeth beneath, but their ventral margin crenulate or wavy, there being three sloping convexities, the distal two bearing a continuous series of minute, black comblike teeth (along the distal half of the margin). Scutellum terminating in a small, bidentate plate. Metathorax with no dorsolateral projections. Vertex very thin, the cephalic ocellus within the scrobicular cavity, the lateral ocelli distinct from the eye margins. Pronotum thin mesad, broadening laterad. Abdomen not produced distad, normal, the second segment largest.

*Type:* The following species.

1. *Stomatoceroides bicolor* new species.

*Female:* Length, 4.10 mm.

Opaque black, the legs dark reddish excepting nearly the whole of the upper margin of the posterior femur, the coxæ, the proximal halves of the tibiæ and the same portions of the cephalic and intermediate femora, all of which are black. Venation brown, the fore wings with a distinct, rounded brownish spot under the marginal vein (against it) and with a larger stain distad more or less obscure and cephalad. Head and thorax rugoso-punctate, the spaces between the punctures with fine grooves, the abdomen, finely densely polygonally reticulated, but the second segment

smooth and shining. Antenna wholly black, the distal two funicle segments subequal, each slightly less than half the length of the proximal funicle joint.

(From a single specimen, the same magnification.)

*Male:* Not known.

Described from a single cardmounted female specimen, labelled "Dandenong Ranges, Victoria."

*Habitat:* Australia—Victoria (Dandenong Mountains).

*Type:* No. *Hy 1186*, Queensland Museum, Brisbane, the above specimen; also a slide bearing an antenna and a second one, an antenna and a posterior leg.

The following species were thought to represent a new genus, but are all components of this one. Their generic characters are given herewith.

The same as *Stomatoceras* Kirby, the antennæ 11-jointed, the pedicel very small; the scrobicular cavity extends nearly to the occipital margin; thus the vertex acute or like a transverse carina along the occipital margin; the lateral ocelli are not within the scrobicular groove, but between its lateral margin, the eye and the true occipital margin, meso-caudad of the eye; the cephalic ocellus, however, just at the apex of the cavity. Postmarginal vein longer than the moderately long marginal, the stigmal vein very short, sessile and oval, small; submarginal vein more than four times the length of the marginal. Scutellum terminating in a small, bidentate plate. Posterior femora beneath simple—that is, without one or two large teeth, with the black, comblike teeth along distal two-thirds or more of the margin, and hairy; ventral margin of the femur straight. Propodeum with at least one dorso-lateral tooth. Antennæ long, cylindrical, without a ring-joint. Abdomen ovate.

The genus *Stomatoceroides* is more like *Hippota* Walker, but the flagellar joints are much longer, the pedicel smaller, the posterior femora armed and straight beneath, the vertex carinate, the propodeal tooth not prominent, the stigmal vein sessile, the wings clouded.

2. *Stomatoceroides nigricornis* new species.

*Male:* Length, 4.1 mm. Slender.

Opaque black, the base of the abdomen shining. Marked with dark red (Garnet) as follows: The tegulæ, tarsi, knees, tips of tibiæ and a spot at base of posterior femur (ventrad and exteriorly). Fore wings with two obscure brownish cross-bands—one at the marginal vein and the other nearly half from there to apex; the first accented under the marginal vein, the second more noticeable a short distance out from the costal margin. Venation dark. Rugoso-punctate, the abdomen distad with fine polygonal reticulations.

(From one specimen, the same magnification.)

Described from a single male specimen, minutien-mounted, labelled "Brisbane, 12–5–11." From the Queensland Museum.

*Habitat:* Australia—Brisbane, Queensland.

*Type:* No. *Hy 1188*, Queensland Museum, Brisbane, the above specimen; antenna and posterior leg on a slide.

3. *Stomatoceroides versicolor* new species.

*Female:* Length, 4.0 mm. More robust than the preceding.

Opaque black, the proximal half of the abdomen and the caudal coxa and femur contrasting, bright orange yellow, with some reddish mixed in; legs otherwise black, the knees brownish; antennæ black; tegulæ black. Wings opaque, the venation dark, the marginal vein with a very distinct, sub-elongate dark brown spot under it, which does not tend to cross the wing, but is wider (proximo-distad) than long (cephalo-caudad).

Structurally agreeing with the type species, but the stigmal vein is curved slightly cephalad, the body is more robust, the antennæ very much the same, but the posterior femora beneath with the fine, black, comblike teeth only along the distal third.

(From one specimen, the same magnification.)

*Male:* Not known.

Described from a single female, minutien-mounted, from the collections of the Queensland Museum, labelled "Hacker, Brisbane.—6-4-11."

*Habitat:* Australia—Brisbane, Queensland.

*Type:* No. *Hy 1189*, Queensland Museum, Brisbane, the forenoted female on minutien mount, plus the flagellum on a slide in xylol-balsam.

4. *Stomatoceroides nigripes* new species.

*Female:* Length, 5.00 mm.

Opaque black, the tarsi fuscous, the wings hyaline, the venation dark, with only a trace of staining under them. Like *versicolor*, but the teeth of the posterior femur along as much as the distal two-thirds of the ventral margin. Antennæ as in the other two species, but the funicle joints are longer.

(From a single specimen, similarly magnified.)

*Male:* Not known.

Described from a single female, cardmounted, kindly given to me by Mr. F. P. Dodd, of Kuranda, North Queensland. The specimen was labelled "From pupa of the red ant moth, Townsville, 7–11–03.—F. P. Dodd."

*Habitat:* Australia—Townsville, Queensland.

*Type:* No. *Hy 1190*, Queensland Museum, Brisbane, the foregoing specimen on a card, plus female antenna and posterior femur on a slide together in xylol-balsam.

Family Callimomidæ.

Podagrionini.

*Pachytomoides* new genus.

*Female:* Somewhat similar to *Pachytomus* Westwood and *Podagrion* Spinola, but the antennæ lack the ring-joint and the club is enlarged, as compared with the slender filiform funicle. The second and third tarsal joints are slender. The stigmal vein has a very short neck. Ovipositor very long. Wings infuscated. Propodeum with a semicircular carina at apex around the insertion of the abdomen.

*Male:* Probably the same.

*Type:* The following species (*mirus*).

1. *Pachytomoides mirus* new species.

*Female:* Length, 5 mm., excluding the long, slender and curled ovipositor, which is fully 7 mm. long.

Bright metallic green, the propodeum and head metallic bluish, the abdomen red, except broadly at base above; the fore and intermediate legs reddish brown at the knees, tarsi, tips of tibiæ, proximal third of the swollen femur and distal third of the long subtriquetrous posterior coxa. Ovipositor very thin, fuscous, its valves black. Fore wings irregularly, lightly stained with

brownish, the venation black. Eyes red, the ocelli darker red. Antennæ with the scape and pedicel brown, the remaining joints black.

Head and thorax very finely reticulately punctate; abdomen tapering at base, but not petiolate, strongly compressed. Ocelli distant from the eyes. Propodeum with larger reticulate punctures, its dorsum rounded, without a median carina. Postmarginal vein twice the length of the stigmal, the marginal very long, not much shorter than the submarginal. Distal third of scutellum and the mesopostscutellum smooth, but finely, closely, polygonally reticulated. Proximal abdominal segments, with very minute pin-punctures, the distal segments glabrous. Posterior coxae sculptured like the postscutellum, the posterior femur beneath armed with nine large, black, unequal teeth; the first (proximal), eighth and ninth largest; the latter stoutest, triangular, tooth 8 longest, columnar; the seventh next to the shortest, paired—that is, a bidentate, erect plate; the two dentations here counted as separate teeth, though united at base; the two teeth equal; teeth 4 and 5 unequal, also more or less united at base; tooth 2 shortest, obtuse, nipplelike.

Antennæ inserted in the middle of the face, 13-jointed, the funicle filiform, but its distal joint widening somewhat, becoming wider than long; scape simple, not as long as the club; pedicel somewhat longer than the first funicle joint; joint 2 of funicle longest, joint 3 next, the distal joint shortest; joint 5 subequal in length to the pedicel, the following funicle joints all shorter, club joints nearly equal, the distal one slightly the longest.

(From a single specimen, the same magnification.)

*Male:* Not known.

Described from a single female, minutien-mounted, in the collections of the Queensland Museum, labelled "Q. M. Brisbane. H. Hacker.—20–5–1911."

*Habitat:* Australia—Brisbane, Queensland.

*Type:* No. *Hy 1191*, Queensland Museum, Brisbane, the forc-described female on a minutien mount, plus one slide of xylol-balsam bearing the antennæ and a posterior femur.

2. *Pachytomoides greeni* (Crawford).

*Podagrion greeni* Crawford, 1912,* pp. 3–4; fig. 1.

This Cingalese species reared from the eggs of a mantid must be referred to this genus, though the female bears an abdominal petiole. Otherwise, it agrees with the species generically.

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## NEW ICHNEUMONOIDEA PARASITIC ON LEAF-MINING DIPTERA.

BY A. B. GAHAN, MARYLAND AGRICULTURAL EXPERIMENT STATION.

With a single exception the type specimens of the seven supposed new species described in the following paper were furnished by Prof. F. M. Webster, of the United States Department of Agriculture, and the designated hosts are on his authority. The types of one species were reared by the writer.

### Family BRACONIDÆ.

### Sub-family Opiinæ.

*Opius utahensis*, n. sp.

Female.—Length, 2.25 mm. Head transverse; vertex, temples, cheeks and occiput smooth and polished with sparse whitish hairs, the frons bare except along the eye margins; face with distinct round punctures and moderately hairy; clypeus fitting closely to the mandibles; mandibles without a notch on the ventral margin; antennæ longer than the body, pubescent, 32-jointed in the type, the first flagellar joint one-third longer than the second. Propleuræ with very fine reticulate sculpture; mesonotum with a median dimple-like impression before the scutellar fovea, parapsidal furrows deeply impressed at the anterior lateral angles, but entirely effaced on the disc; mesopleuræ reticulately sculptured on the disc, with a broad, rugose or foveolate furrow along the dorsal and anterior borders joining a similar furrow which separates the mesopleuræ from the mesosternum; propodeum and metapleuræ strongly rugose. Wings hyaline, stigma lanceolate emitting the radius at about the basal one-third; the radius strongly angulated at the second cubital cross vein, attaining the margin of the wing some distance above the extreme wing apex, its first abscissa less than

*Proc. U. S., National Museum, Vol. 42.

half as long as the width of stigma; second discoidal cell closed at the apex or nearly so. Abdomen broadly oval, the first dorsal plate rather thick, with precipitous edges and finely wrinkled, slightly wider at apex than at base and distinctly longer than broad; second segment two times as wide at apex as at base, smooth like the following segments; ovipositor slightly exserted.

Clypeus, mandibles, palpi, scape, tegulæ, base of wings, legs except apical joint of the tarsi, and abdomen except the first dorsal plate pale testaceous; apical joints of all tarsi, and the flagellum brown-black; wing veins and stigma brownish; remainder of the body black.

Male.—Essentially like the female, but with the antennæ 33-jointed in type.

Type locality.—Salt Lake, Utah.

Host.—*Agromyza parvicornis.*

Type No. 15591, United States National Museum.

One female and five male specimens from the type locality, labelled Webster, No. 8819.—C. N. Ainslie, collector.

Probably closest to *O. bruneiventris* Cr. of the described species, but readily separated from that species by the fact that in *bruneiventris* there is a distinct opening between the clypeus and mandibles, and the mesopleuræ are smooth and polished except for the oblique, foveolated furrow below the middle.

*Opius suturalis*, n. sp.

Male.—Length, 1.25 mm. Head transverse, smooth, with few hairs above; the face only slightly hairy; clypeus arcuate, leaving a transverse elliptical opening between it and the mandibles; antennæ pubescent, twice as long as the body, 22-jointed in the type. Thorax smooth and shining; mesonotum without a median depression posteriorly, the parapsidal furrows indicated only at the anterior lateral angles of the mesonotum; mesopleuræ smooth, with a shallow, ovate, non-foveolated impression below the middle; propodeum smooth and polished. Wings thickly ciliated; the stigma lanceolate, emitting the radius before the middle. The first abscissa of radius short, third abscissa attaining the wing margin far before the extreme wing apex; second discoidal cell not

completely closed at the apex. Abdomen spatulate, as long as the thorax, the first dorsal segment very finely but distinctly rugulose; second segment with a distinct transverse suture before the middle, which does not extend quite to the margins; the surface before the suture and for one-third of the distance beyond distinctly rugulose; segments beyond the second smooth. General color shining black; mandibles and palpi slightly fuscous; tegulæ testaceous; wing veins and stigma brownish; legs testaceous, their coxæ piceus. Abdomen wholly black.

Type locality.—Tempe, Arizona.

Host.—*Agromyza pusilla.*

Type No. 15592, United States National Museum. Two male specimens from the type locality, labelled Webster, No. 7215.—V. L. Wildermuth, collector.

Distinguished from *O. aridus* by the presence of a distinct transverse furrow on the second segment and by the rugulose sculpture of that segment. May possibly be the male of *O. nanus* Prov., from the type of which it differs, however, in the smooth propodeum and the wholly black abdomen.

*Opius aridis*, n. sp.

Female.—Length, 1.25 mm. Head perfectly smooth and polished, the face moderately hairy; vertex, temples and occiput with sparse, inconspicuous hairs; clypeus arcuated apically, leaving a distinct opening between it and the mandibles; antennæ somewhat longer than the body, 18-jointed in the type (varying from 18-jointed to 23-jointed in other specimens of the series), the first joint of the flagellum slightly the longest. Thorax smooth and polished; mesonotum without a median depression or furrow before the scutellar fovea, parapsidal furrows impressed at the anterior lateral angles of the mesonotum, but not attaining to the disc; mesopleuræ smooth, with a shallow, ovate, non-foveolated impression below the middle; propodeum moderately hairy, nearly smooth; the apical margin very slightly roughened. Wings densely ciliated, giving them a brownish tinge; stigma lanceolate, the radius arising before the middle, and attaining the wing margin above the extreme wing apex; its first abscissa shorter than the

width of stigma; second discoidal cell closed. Abdomen not longer than the head and thorax; the first dorsal segment longer than wide at apex, smooth and polished like the following segments: ovipositor sheath extending slightly beyond the tip of the abdomen. General colour, black; clypeus, mandibles and palpi stramineous; tips of mandibles brown; legs in the type stramineous, the apices of posterior tibiæ, their tarsi and the median tarsi fuscous (in other specimens of the type series the legs vary from pale stramineous to wholly dark brown); tegulæ and wing base brownish testaceous; 2nd segment of the abdomen more or less stramineous, first segment and those beyond the second piceous to black; ovipositor sheath black.

Male essentially like the female, but with the antennæ 20- 23-jointed.

Type locality.—Tempe, Arizona.

Host.—*Agromyza pusilla.*

Type No. 15593, United States National Museum. The type series contains 10 females and 10 males, labelled Webster, No. 7215.—V. L. Wildermuth, collector.

This species in general appearance closely resembles *Opius* (*Eutrichopsis*) *agromyzae* Vier., which is parasitic on the same host. It may be distinguished from that species, however, by the non-foveolated impression on the mesopleuræ and the smooth first abdominal segment.

*Opius bruneipes*, n. sp.

Female.—Length, 1.25 mm Head perfectly smooth and highly polished; face sparsely hairy; vertex, temples and occiput with a few scattering and inconspicuous hairs; clypeus arcuated on the anterior margin, leaving a transverse, elliptical opening between it and the mandibles; antennæ longer than the body, pubescent 21-jointed in the type, the first joint of flagellum slightly longer than the second. Thorax smooth and highly polished, robust, without a median dimple-like depression on the mesonotum, parapsidal furrows wholly effaced or represented by only a few indistinct punctures at anterior lateral angles; mesopleuræ without a trace of an impressed furrow above the coxæ; propodeum entirely smooth and polished, with very few hairs; metapleuræ also smooth.

Wings densely ciliated; the stigma lanceolate and rather broad, much broader than the first abscissa of radius is long; radius arising much before the middle and attaining the wing margin far above the extreme wing apex; its first abscissa very short; second discoidal cell open below at the apex. Abdomen ovate, about as long as the thorax; its first dorsal segment smooth and polished, or nearly so; following segments also smooth; second segment more than twice as wide at apex as at base; following segments tapering to the apex; ovipositor slightly exserted. General color black; mandibles brownish, tips black; palpi fuscous; scape dark brown, flagellum brown-black; tegulæ black; wing veins and stigma brownish; legs including coxæ, dark brown; the anterior pair slightly paler; first and second abdominal segments brownish; following segments black; ovipositor sheath black.

Male.—Essentially as in female.

Type locality.—Lakeland, Florida.

Host.—*Agromyza pusilla.*

Type No. 15594, United States National Museum. The type series consists of three females and three males from the type locality, labelled Webster, No. 9489.—G. G. Ainslie, collector.

The species is distinguished from *O. aridus* by the total absence of the mesopleural furrow, and the open second discoidal cell as well as by the dark brown legs and fuscous palpi.

*Opius succineus*, n. sp.

Female.—Length, 2 mm. Head transverse, smooth and polished, sparsely hairy; the face moderately hairy, impunctate, with a rather more distinct median ridge than usual; clypeus arcuate, leaving a transverse, elliptical opening between it and the mandibles; antennæ longer than the body, pubescent, 29-jointed in the type. Propleuræ smooth; mesonotum with a median dimple-like impression before the scutellar fovea, the parapsidal furrows distinctly impressed anteriorly for nearly one-third the length of the mesonotum and faintly traceable as shallow impressed lines to the median dimple; mesopleuræ smooth, but with a strongly oblique foveolate furrow below the middle; propodeum indefinitely sculptured faintly rugulose, with a sinuous, transverse raised line or carina near the middle. Wings hyaline, the stigma lanceolate;

the radius arising near the basal one-third of the stigma and attaining the wing margin only slightly above the wing apex; its first abscissa about as long as half the width of stigma; second discoidal cell closed. Abdomen broadly oval; the first dorsal plate distinctly longer than broad, abruptly narrowed before the middle, indefinitely rugulose; segments beyond the first smooth; ovipositor slightly exserted. General colour brownish yellow; vertex, occiput and temples black; cheeks and face reddish testaceous; ovipositor black; wing veins and stigma brownish; the dorsal abdominal segments beyond the second brownish; scape and legs pale amber.

A male paratype is like the female in sculpture but much darker in colour; the thorax above and at sides strongly tinged with brownish.

Type Locality.—Lafayette, Indiana.

Host.—*Agromyza* sp., mining leaves of Panicum.

Type No. 15595, United States National Museum. The female type is labelled Webster, No. 3814, W. J. Phillips, collector. The male bears the same number, but was collected by P. Luginbill. Another male specimen, labelled Webster, No. 9302—J. J. Davis, collector—was reared from the same source at Danville, Illinois.

This species superficially resembles *Opius diastatae* Ashm., a parasite of the corn leaf-miner, which was described by Ashmead under *Bracon* (Proc. U. S. Nat. Mus., 1888, p. 617). It may be distinguished from that species by the foveolate mesopleural furrow and the dimple-like median impression on the mesonotum.

Family ALYSIIDÆ.

Subfamily Dacnusinæ.

*Dacnusa scaptomyzae*, n. sp.

Female.—Length, approximately 2 mm. Head transverse, nearly twice as broad as long; above perfectly smooth and highly polished, with a very few scattered whitish hairs on the vertex and occiput; occiput concave; temples broad and slightly rounded; vertex divided by a shallow median groove, running from the anterior ocellus to the occiput; eyes bare, ovate; face with moderately dense whitish pubescence, smooth or nearly so, the punctures being very minute, a rather distinct median carina on the upper half; maxillary palpi 6-jointed, the two basal joints about equal in

length and together scarcely longer than the third; labial palpi 4-jointed; mandibles 3-toothed, the median tooth longest and acute; the two laterals short and blunt; antennæ pubescent, 23-24 jointed, a little longer than the body; first joint of the flagellum longer than the second, following joints decreasing in length to the tip.

Thorax smooth and shining; prothorax short, mostly concealed from above; mesonotum gibbous, polished, without pubescence, except for four or five hairs on each lobe opposite the base of the wings; parapsidal furrows impressed anteriorly for about one-third the length of the mesoscutum, a short longitudinal incision on the median line just before the scutellum, varying somewhat in length, but never extending more than half the length of the mesonotum; scutellar fovea broad and deep, with several carinæ crossing it at the bottom; mesopleuræ smooth, polished, glabrous, except for a few hairs at the posterior angle, just above the median coxæ, and with a shallow longitudinal smooth depression below the middle; metapleuræ moderately hairy and mostly rugulose, the disc smooth; propodeum finely rugose, more strongly so posteriorly, not conspicuously pubescent, but with a few scattering hairs most abundant laterally. Wings hyaline, iridescent; stigma long, lanceolate, rather broad, extending half the length of the radial cell; radius arising at about the basal one-third of the stigma and attaining the wing margin about half way between the apex of stigma and the extreme wing apex, its first abscissa nearly perpendicular and slightly longer than the width of stigma; second abscissa slightly straightened toward the wing margin, but not concave beneath, radial cell broad; cubital cross-vein oblique, somewhat longer than the first abscissa of radius; recurrent nervure oblique, joining the first cubital cell before the cubital crossvein, a distance equal to about half the length of the cubital crossvein; first discoidal cell smaller than the first cubital, submedian cell slightly longer than the median, the second discoidal completely closed.

Posterior legs longer than the body, the two trochanter joints together about as long as their coxæ, tibiæ as long as the femora and trochanters combined, tarsi as long as the tibiæ, the first joint nearly twice the length of the second.

Abdomen subsessile, as long as the thorax, ovate, squarely cut off at the apex, the apical segments retracted; first segment rugose, broader at the apex than at the base, as long as the posterior coxæ, its spiracles about midway of the segment and prominent, basally the segment is bicarinate, the carinæ originating at the lateral and angles and meeting before the spiracles, back of the triangular area enclosed by the carinæ, the surface is convex, the posterior lateral angles depressed; segments beyond the first smooth and polished; ovipositor sheath about one-fourth the length of the abdomen.

Colour.—Shining black; palpi, labrum, scape and legs, including the coxæ, testaceous; mandibles slightly darker; flagellum brown-black, the basal joints paler; first segment of the abdomen black, the following dorsal segments very dark brown, the second segment often somewhat testaceous on the disk. Wing veins and stigma brownish testaceous.

Male.—Like the female in every respect, except that the antennæ are 24-25-jointed; the stigma is broader than the length of the first abscissa of radius, considerably broader than in the female; the abdomen is slightly longer than the thorax and attains its greatest width just before the apex, therefore not ovate, but spatulate.

Type locality.—College Park, Md.

Host.—*Scaptomyza flaveola* Meig.

Type Cat. No. 15596, U. S. National Museum. Paratypes in the United States National Museum and the Collection of the Maryland Agricultural Experiment Station.

During the season of 1912 the dipterous leaf miner *Scaptomyza flaveola* Meig. was collected by the writer in three different localities and on as many different dates. June 3rd, at Hyattsville, Md., it was found infesting the leaves of turnips in a small garden plot. Both larvæ and puparia were present in large numbers. The puparia were found either in the original larval mines or beneath wilted and fallen leaves on the ground. The majority seemed to have pupated in the leaves, and none seemed to have entered the soil to transform. Many leaves were collected and taken to the laboratory, and from these were reared during the month of June

a large number of the flies, and about an equal number of *Dacnusa scaptomyzae*.

July 1st, at Hancock, Md., mined leaves of radish were collected, from which were reared the same fly, as well as several specimens of the parasite.

July 30th, at College Park, Md., several cabbage plants growing in a box, where they had been seeded for transplanting, were found severely mined. Here again the same fly and many specimens of the parasite were reared during the month of August.

*Dacnusa agromyzæ*, n. sp.

Female.—Length, approximately 2 mm. Head twice as broad as long, smooth, with a very few scattering hairs on the occiput, vertex and cheeks; the face moderately hairy, with a slight median carina on the upper half; vertex not divided by a median furrow; eyes bare, ovate; maxillary palpi 6-jointed, the two basal joints together not as long as the third, the fourth joint as long as 1, 2 and 3 combined; labial palpi 4-jointed; mandibles with the two lateral teeth acute, the median tooth longer, with a distinct notch on its ventral margin near the base making the mandible appear four-toothed; antennæ 33-36-jointed, nearly or quite twice as long as the body; the first joint of the flagellum about equal to the scape and pedicle combined; following joints shorter and decreasing in length toward the tip.

Prothorax mostly concealed from above; mesonotum slightly bilobed owing to a broad depression extending from base to apex along the median longitudinal line, its surface anteriorly and medially punctate and covered with white hairs, the broad posterior angles opposite the tegulæ smooth and glabrous, parapsidal furrows not at all impressed; scutellar fovea deep, with several cross ridges at the bottom; mesopleuræ polished and glabrous except for a few hairs just above the median coxæ, with a shallow, longitudinal, smooth depression below the middle; metapleuræ covered with a dense, short, white pile, completely concealing its sculpture; propodeum high and broad, abruptly truncate posteriorly, rugose and covered with white pile, which is not as dense as that on the metapleuræ. Stigma linear and extending nearly two-thirds the length of the radial cell; radius arising at about the basal one-fourth of the

stigma; its first abscissa not quite perpendicular and slightly shorter than the cubital crossvein, second abscissa curving very slightly into the radial cell toward the apex and attaining the wing margin far above the extreme wing apex; recurrent nervure interstitial with the cubital crossvein; submedial cell longer than the median; second discoidal cell open beneath.

Posterior legs longer than the whole body, their tibiæ scarcely as long as the femora and two joints of the trochanter combined; coxæ equal to the first abdominal segment, first tarsal joint twice the length of the second.

First abdominal segment convex, rugose, wider at apex than at base; bicarinate at base, the carinæ originating at the lateral angles and converging posteriorly, but fading out before meeting; spiracles not prominent and placed slightly before the middle of the segment; sides of the segment parallel beyond the spiracles; the posterior lateral angles somewhat flattened; whole abdomen slightly longer than the thorax; the segments beyond the first smooth and but little wider than the first segment at apex, their sides parallel. Ovipositor sheath less than one-fourth the length of the abdomen.

Colour as in the preceding species, except that the legs are reddish testaceous and the abdomen, including the first segment, is brownish testaceous.

The male is like the female.

Type locality.—Lafayette, Indiana.

Host.—*Agromyza angulata.*

Type No. 15597, United States National Museum.

Four specimens received from Prof. F. M. Webster, reared by P. Luginbill, and bearing Webster's number, 9700.

This species would apparently fall in Foerster's genus Mesora, which genus is believed to be untenable.

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## NOTES ON SOME SPECIES OF THE GENUS PROSOPIS.

BY J. C. CRAWFORD, WASHINGTON, D. C.

*Prosopis mesillæ* Cockerell.

This is a valid species, and not a form of *P. cressoni* as it is given by Metz. Externally the two are easily separable. *P.*

*cressoni* has the propodeum coarsely sculptured, while *mesillæ* has it very finely wrinkled. The eighth ventral plates of the males are quite different, and are therefore figured. In *cressoni* the apical lobes are much shorter than the pedicel attaching them to the plate; in *mesillæ* they are longer than the pedicel.

*Prosopis nelumbonis* Robertson

Synonym *P. fossata* Metz.

The characters which Metz gives as distinguishing this species from all others—namely, the "coarse, dense, pit-like punctures over the entire head and thorax"— are almost the identical words used by Robertson in his original description of the species. The type of *fossata* is in the U. S. Nat. Museum, and I have carefully compared it with specimens of *nelumbonis* from Illinois.

*Prosopis stevensi*, new species.

Male.—Length, about 4.25 mm. Black, face below insertion of antennæ old ivory colour, with sparse punctures and silky from minute vertical striatulations, supra-clypeal mark extending upward between antennæ, truncate at tip; lateral face marks extending above insertion of antennæ, dilated above; slightly extending over antennæ and very slightly away from eye margin (fig. 5),

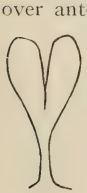

Fig. 3. *P. messillæ*, male.— Part of 8th ventral plate.

Fig. 4. *P. cressoni*, male.— Part of 8th ventral plate.

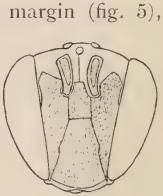

Fig. 5. *P. stevensi*, male.— Face.

face above insertion of antennæ, with rather close and coarse punctures; scape with an ivory stripe in front; flagellum reddish, dusky above; mesonotum with punctures similar to those on vertex, separated from each other by slightly less than a puncture width, surface between punctures lineolate; metanotum rugosopunctate; propodeum with the area not well defined, very coarsely rugose; laterad of it more finely rugose; propodeum sharply truncate behind, truncation surrounded by a salient rim; pronotum with two spots, tubercles, tegulæ with a spot, fore tibiæ with a stripe, mid

and hind tibiæ at bases and apices, and basal joints of all tarsi, ivory colour; mesopleuræ more coarsely punctured than dorsum; wings dusky; first abdominal segment finely sparsely punctured, punctures closer towards apex, second and following segments

FIG. 6. *P. stevensi*, male.—Seventh ventral plate.

FIG. 7. *P. stevensi*, male.—Part of 8th ventral plate.

FIG. 8. *P. stevensi*, female.—Face.

more closely punctured. See figures 6 and 7 for structure of seventh and eighth ventral plates.

Female.—Length, about 5.25 mm. Similar to the male; face below antennæ more distinctly striatulate and more silky; a large mark on each side of face (see fig. 8), a spot on each side of pronotum, tubercles, a spot on tegulæ, a spot on fore and mid tibiæ at base and a broad annulus on base of hind tibiæ, ivory colour.

Type locality.—Fargo, N.D.

Type male collected Sept. 6, 1912 (Stevens No. 4154); allotype female the same date (Stevens No. 4152); paratype female, Sept. 8, 1912 (Stevens No. 4194); paratype female, Aug. 26, 1912 (Stevens No. 3947). All four specimens taken on *Melilotus alba* by Mr. O. A. Stevens, after whom the species is named.

Type Cat. No. 15530, U. S. N. M.

Two paratype females in collection Mr. Stevens.

In the classification of the genus by Metz, this species belongs to his *cressonii* division and to the *tridentulus-grossicornis* group and differs from these two species in the male having fewer teeth on the outer margin of each wing of the seventh ventral plate, in these teeth being stouter and more markedly turned up at end. Neither of the older species has the propodeum strongly rugulose nor so abruptly truncate, and the face markings are quite distinct; etc.

## OBITUARY.

We record with much regret the death of Miss Mary E. Murtfeldt, which took place at her residence in Kirkwood, Mo., on the 23rd of February last. She was a contributor from time to time to the pages of this magazine and a subscriber for a long series of years. When the late Dr. C. V. Riley was State Entomologist of Missouri she gave him much material assistance, studying and recording the life-histories of many species of insects in the preparation of his series of reports on the Insects of Missouri, which are amongst the most valuable of his writings. After his appointment to be Chief of the Bureau of Entomology at Washington, she continued her interest in entomology. Her contributions were always of much value, as she was very painstaking and accurate in her observations. She belonged to several scientific societies, and was highly esteemed by all who had the pleasure of her acquaintance.

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## A NOTE ON *GRAPTA J-ALBUM*.

During the month of August, 1908, whilst camped in a mountain valley, engaged in collecting insects, I was interested to observe this butterfly attracted to a piece of bacon hanging in a small tree near the tent. It fluttered round for a few minutes and settled several times upon the bacon. Shortly it was joined by two other individuals, both of which alighted as did the first comer. They must have been attracted as are some other Lepidoptera, by the scent, perhaps. That the drawing power of the bacon was powerful was evident from the fact that during our stay of three days at this spot these butterflies were always to be seen during the warm part of the day hovering round what we called the bacon tree, and constantly alighting on and round the attractive board.

E. P. Venables.

## BOOK NOTICES.

"Injurious Insects: How to recognize and control them," by Prof. Walter C. O'Kane. The Macmillan Company, New York. 414 pages, 606 figures; $2.

The reviewer's pen has hardly dried after noticing Prof. Sanderson's manual of injurious insects when his successor, as Entomologist to the New Hampshire Experiment Station, adds another to the existing number of general works on injurious insects. The two outstanding features of the book are—first, the large number (over six hundred) of illustrations from the author's own photographs; and, second, the arrangement of his subject matter.

In regard to the illustrations: While the author is to be congratulated in his endeavor to provide entirely original illustrations, the preparation of which must have involved an enormous amount of labour, we must admit that in very many instances he would have been more successful in his representation of the insects had he given us line drawings or reproduced some of the really good available cuts. Those who have attempted it realize the difficulties of insect portraiture. The purpose of such illustrations is to facilitate the identification of the insects, but it must be confessed that a considerable proportion of the illustrations are not such as will provide a good means of recognition, especially in the case of larvæ. On the other hand, the author has in some cases given us excellent figures The illustrations would have been more valuable had the magnification been given when the insects are enlarged.

As a means of assisting in the identification of the insect pests of garden and field crops, of orchard and small fruits, all of the chief species of which are described, the author has arranged the insects belonging to these two groups according to the place where they are found at work. Insects working in the soil are considered first, then the borers within the stem, trunk or branch. These are followed by those feeding upon the surfaces of the same. Finally, he deals with the insects feeding on the leaves, flower and fruit in the order named. The leaf-feeders are also grouped. It is hoped by the author that this method of grouping will prevent the usual

duplication which sometimes cannot be avoided if the insects are grouped according to host plants, owing to many of the common species feeding on several species of plants. Insect pests of the household and of stored products are also described.

In chapters of varying lengths the morphology, internal structure, senses and behaviour, metamorphoses, classification and means of dissemination are described in language devoid of technicalities that might confuse the general reader. The preventive measures are well discussed, and the chapters on insecticides and fumigants and the methods of applying them form a useful section of the book and increase its value as a book of reference for those who have to deal with insect pests. A list is given of references to bulletins and reports containing detailed descriptions of the insects described in the book. An idea of the large number of insects which the author considers may be gathered from the fact that the index to the book covers twenty-four pages.

Covering the large field that it does, it is not surprising that inaccuracies occur, and space forbids a detailed reference to the same. In compiling information of so varied a character, greater care is necessary than when the information is the result of personal knowledge A work of this character is an enormous undertaking nowadays, and we cannot but feel that the author would have produced a better book had he spent more time in its preparation. Nevertheless it will be a useful book, and the author deserves our thanks.

C. G. H.

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## Dolichopodidæ in Lundbeck's "Diptera danica."

Diptera Danica.—Genera and species of flies hitherto found in Denmark. Part IV., Dolichopodidæ. By William Lundbeck; 416 pp., 130 figs. (Copenhagen, G. E. C. Gad; London, William Wesley & Son.) Dec., 1912. $4.25.

After a lapse of two years since the previous part of this work appeared (reviewed in this journal, Vol. 43, April, 1911), the author gives us the fourth part, which treats of the single family Dolichopodidæ. Most entomologists know these small, usually

metallic golden-green, flies, which appear, as Verrall said, "to be standing on tiptoe," being raised on their front legs. Their wing venation is very characteristic. The most remarkable thing about the family, however, is the sexual dimorphism of the male, which reaches a higher degree of development in this family than in any of the other family of the Diptera. These secondary sexual characters occur primarily on the legs, but they are also found on wings, antennæ and facial region. Associated, as is usually the case, with these secondary sexual characters in the male Dolichopodids are remarkable "courting" habits, which not infrequently strongly recall the analogous amatory preliminaries on higher animals. The flies are all predaceous, feeding on other insects and small invertebrates, and are usually found on bushes, on low herbage and grass in woods and outside, generally in damp localities and more or less near water. In North America we have little information as to their life-histories; the larvæ occur in earth rich in vegetation and under the bark of trees. The species are distributed all over the world, two species of *Dolichopus* being found in Greenland. From North America about 526 species are known, from the palæarctic region about 586 species are known, and ten species are recorded as common to both regions.

Aldrich divides the family in North America into twelve subfamilies, and although the former worker has given no diagnoses, the author of the present work believes them to be good and natural. As he has only examined the Danish species closely, he follows the arrangement of the "Katalog der Palä̈arktischen Diptera," and divides the family into four subfamilies, at the same time admitting the heterogeneous nature of some of them.

As in the previous parts of this excellent work, the author treats each species fully; where they are known, larval characteristics and habits are given, and the presence of one hundred and thirty figures, chiefly of the antennæ and wings, enhances the value of this further and most welcome addition to our dipterological literature. We look forward to the succeeding parts of this monumental work, in the preparation of which the author has our good wishes.

C. G. H.

Mailed May 17th, 1813.

The Canadian Entomologist.

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# NEW NYMPHS OF CANADIAN ODONATA

BY E. M. WALKER, TORONTO, ONT.

During the summers of 1907, 1908 and 1912, the writer spent much of his time at the Great Lakes Biological Station, Go Home Bay (Georgian Bay), Ont., in collecting and rearing dragonflies (Odonata). A full account of this work will appear in the forthcoming report of the Marine Biological Stations of Canada; but, as this report will not be issued in the immediate future and is comparatively unknown to entomologists, it is thought best to publish in advance the descriptions of the new nymphs obtained.

Nymphs of certain species of Aeshna, which were reared for the first time at Go Home Bay, have already been described in the writer's memoir on this genus,* and are omitted from the present account. In addition to the species described from Go Home Bay, the nymph of *Somatochlora semicircularis* (Selys) from Vancouver Island is also included.

*Nehalennia gracilis* Morse

A few nymphs of this species were found in floating sphagnum bogs, some distance back from the open water. Several imagoes emerged in the laboratory during July.

I have compared these nymphs carefully with a few specimens of *N. irene* (Hagen) from Toronto, and the only differences I can find are the smaller size, less spinulose hind margin of the head and entire absence of spots on the gills. It is not improbable that none of these characters are constant, as I had but few specimens of either species for comparison.

In *N. gracilis* the convex posterior margin of the head has only 4-6 slender inconspicuous colourless spinules; in *N. irene* there are a dozen or more spinules, which are somewhat coarser and blackish at base (Figs. 2, 3); gills very slender, widest in the distal third, tapering somewhat more gradually than in *N. irene*, with no indication of spots (Fig. 1).

*The North American Dragonflies of the genius Æshna. University of Toronto Studies, Biological Series, No. 11, 1912.

Length of body 8.25-9; gills 3-3.75 additional; hind wing-case 2.2-2.7; hind femur 2-2.33; width of head 2.33-2-4.

*Enallagma cyathigerum calverti* (Morse)

Full-grown nymphs were taken early in the season of 1912, several emerging in the laboratory on June 3 and 4. Mature adults were flying in numbers on June 1, and had about disappeared by the middle of the month. Nymphs were also reared at Lake Simcoe in 1909, adults emerging on June 4.

The nymph (Figs. 4, 5) is very similar in form to that of *E. hageni* (Walsh), but is considerably larger, with much darker gills. Eyes as in *hageni*, less prominent than in *E. signatum* and *E. pollutum* (Figs. 6, 7, 9), the curve of the posterior median excavation somewhat more flattened than that of the rather strongly convex margins on each side, the latter with a dozen or more spinules. Labium with 4 mental setæ and 6 (occasionally 5) lateral setæ; end-hook of lateral lobe preceded by 3 teeth of moderate size, which are preceded by 3 or 4 smaller, somewhat incurved denticles. Gills lanceolate, widest a little beyond the middle, ventral margin straight at base, dorsal margin convexly curved; apices bluntly pointed, with convexly curved margins or rounded. Across the middle of the gill is a distinct joint, proximad of which the margins are spinulose, the spinules of the ventral margin stronger than those of the dorsal; distad of the joint the margins are beset with a fringe of delicate hairs, much longer than those of *E. hageni*. Color dark brownish (probably olivaceous in life, each abdominal segment, except 10, with a dark lateral blotch, not seen in the exuviæ; femora with a pale ring just before the apex, preceded by a dark ring. Gills dark greyish brown, deepening just beyond the median joint.

Length of body, 15.5(exuvia)-21.5; gills 6.5-8; hind wing 4.5-5; hind femur 4; width of head 3.5-3.7.

*Enallagma pollutum* (Hagen) Selys.

Among a number of Odonate nymphs, taken by Mr. R. P. Wodehouse at Waubaushene and Fitzwilliam Island, Georgian Bay, in 1912, are numerous specimens of an undescribed form, which is so obviously nearly related to *E. signatum* that we have little hesitation in ascribing it to *E. pollutum*. This species is,

moreover, a common one here and is the only Enallagma of the region whose nymph has not been reared (except the rare *E. ebrium*).

Nymph (Figs. 9, 10), long and slender, eyes very prominent laterally, their postero-lateral margins forming with the sides of the head a marked excavation. Hind angles of head with numerous slender setæ, rounded, but very prominent and narrower than the median concavity. Labium with 3 mental setæ: lateral setæ 5; lateral lobes, before the end-hook, with three well-marked teeth, preceded by a feebly denticulate, almost truncate, margin. Abdominal segments 2-7, with prominent postero-lateral angles. Gills large, broad lanceolate, widest at the distal third, with a transverse median joint; basal half dark, except at the base; apical half whitish or grey, except a broad, dark anteapical band.

Colour brown (alcoholic, probably greenish in life), sides of head and thorax with a pale longitudinal band between two dark bands, the most ventral of which passes dorso-caudad to the bases of the front wing-cases. There are usually also a few dark spots on the head and thorax. Abdomen rather dark brown, almost uniform. Legs pale, femora with a very narrow, but usually well-defined, dark ring at the distal fourth.

Length of body 13 (contracted) to 18 (extended); gills 5-6.5; hind-wing 4.3-5; hind femur 3.5; width of head 3.25-3.4.

*Boyeria grafiana* Williamson.

The dark-coloured nymphs of this species are found rather commonly under stones, along more or less wave-beaten shores or wherever there is a perceptible current. Full-grown specimens were collected on and after June 4, 1912, the first adult emerging in the laboratory on July 14, followed by several others during the succeeding fortnight.

As the nymph of *Boyeria vinosa* was described before *B. grafiana* had been recognized as a distinct species, it is impossible to be certain whether the descriptions all refer to *B. vinosa* or not, but Needham's description* belongs, with scarcely a doubt, to that species.

We have reared a number of nymphs of *B. grafiana* and collected many exuviæ as well as nymphs in several localities. We have also received a series of exuviæ of a Boyeria from the Shawa-

*Bull. 47, N. Y. State Museum, p. 465, 1901.

naga River, collected by Mr. Paul Hahn, which differ very slightly from those of *B. grafiana*. The latter were also found on the same river. As *vinosa* and *grafiana* are the only North American species of Boyeria, and are both common in this region, there can be no doubt that the species not yet reared is *B. vinosa*.

The nymphs of these two forms may be separated as follows:

Mentum of labium, 5.5 mm. long, its middle breadth scarcely less than half its length; fourth abdominal segment without lateral spines; lateral abdominal appendages of female one-fourth to one-third as long as the inferior appendages, and usually about as long as the dorsum of segment 10.....*B. vinosa*.

Mentum of labium 6.5-7 mm. long, its middle breadth distinctly less than half its length; fourth abdominal segment generally with distinct though very small lateral spines; lateral abdominal appendages of female, one-fifth to one-fourth as long as the inferior appendages, and one-half to three-fifths as long as the dorsum of segment 10.....*B. grafiana*.

*B. grafiana* also differs from *B. vinosa* in the slightly stouter inferior abdominal appendages, which are less incurved at the tips, and in the slightly larger size as shown by the following measurements:

*B. vinosa*.—Length of body 34-36.5; hind wing 6-7.5; hind femur 5-6; width of head 7.5-8.

*B. grafiana*.—Length of body 37-39; hind wing 7.5-8; hind femur 6-6.5; width of head 8-8.5.

In coloration the nymphs of these two species are quite similar, except that the pale, wavy, dorso-lateral streak on each side of the abdomen is usually quite distinct in *grafiana*, but more or less obscure in *vinosa*. In both species the depth of coloration varies considerably, usually being a rather dark brown. All the nymphs from the Go Home Bay district are very dark in colour, but the pale bands of the abdomen and legs are quite sharply defined. The most characteristic mark of Boyeria nymphs is a pale oval or diamond-shaped median blotch in the dorsum of segment 8.

*Neurocordulia yamaskanensis* (Prov.) Selys.

The nymphs of this interesting species are common at Go Home Bay and in the Muskoka Lakes district. They cling to the under sides of boulders, along the more exposed rocky shores or

near rapids. Exuviæ are often found on precipitous rocks rising out of the water from a depth of 8 or 10 feet.

Nymph (figs. 15–17) short-legged and somewhat stouter than most Corduliine nymphs. Head broadly convex above and on the sides, eyes not very prominent, frontal ridge with a scurfy pubescence, the anterior margin convexly curved, hind angles of head prominent, distance between them a little greater than half the greatest width of the head; hind margin distinctly excavate.

Labium extending very slightly behind the bases of the front legs; mentum somewhat broader at the distal margin than long, the middle lobe somewhat abruptly deflexed, bluntly obtusangulate; mental setæ 9-11, the innermost 3 or 4 much smaller than the others; lateral lobes triangular, their distal margins produced into seven semi-elliptical teeth; lateral setæ 6; movable hook very slightly arcuate.

Marginal ridge of pronotum produced on each side behind the posterior angles of the head as a prominent process, which is somewhat smaller than the very prominent supra-coxal processes.

Legs short, the length of hind femora being slightly less than the width of the head.

Abdomen ovate, its greatest breadth at segs. 6 or 7, slightly greater than two-thirds of its length; curve of the lateral margins somewhat stronger in the distal than in the proximal half; lateral spines on 8 and 9, in each case about one-third to one-half as long as the corresponding segment, those on 8 strongly divergent, on 9 parallel and extending caudad scarcely or not at all beyond the tips of the appendages.

Dorsal surface rather strongly convex, dorsal hooks present on 1–9, those of the basal segments slender, nearly erect and slightly hooked, becoming gradually broader and lower caudad, and, on 7–9, reduced to scarcely more than a short ridge. Superior appendage triangular, equilateral, very slightly shorter than the somewhat divergent inferior appendages and somewhat longer than the lateral appendages.

Colour yellowish or orange-brown, variegated with dark-brown. Head dark brown above, generally somewhat paler in the centre and on the frontal ridge. Thorax and wing-cases variegated with pale and dark markings, femora and tibiæ dark, with

two pale rings—a median and an anteapical. Abdomen yellowish brown, more or less distinctly blotched with dark brown, especially on the dorsal hooks, the lateral margins and spines and the dorso-lateral scars.

Measurements.—Length of body 22-24.5; mentum of labium 4; hind wing 6-7; hind femur 5.5-6; width of abdomen 9-10; width of head 6.5.

The nymph of this species shows the following differences from that of *N. obsoleta* (Figs. 18-19), two exuviæ of which I have from Lake Hopatkong, Pa., received from Professor P. P. Calvert.

Somewhat larger, more elongate, and less depressed; eyes somewhat less prominent, mentum of labium a little longer and more narrowed at base; middle and hind legs somewhat less widely separated at their bases; abdomen narrower, the sides less strongly curved on the middle segments; lateral spines on seg. 9 much shorter than those of *obsoleta*, in which they are fully as long as the segment and extend far beyond the tips of the appendages; dorsal hooks also less developed than in *obsoleta*, in which they form quite prominent tubercles on segs. 7-9.

*Tetragoneuria spinigera* Selys.

We have reared only two females of this species, these emerging on June 2, 1912, at a time when the period for transformation was about over. We also found a teneral male with its exuvia on June 1 and a large number of similar exuvia, which must belong to *T. spinigera* as *T. cynosura simulans*, the only other species resident in the Go Home Bay district, does not appear until a little later in the season.

A careful comparison was made between the exuviæ of these two species, but no differences could be detected between them, except that in *spinigera* the lateral abdominal appendages average slightly longer than those of *cynosura*. This difference, however, does not appear to be constant. Prof. Needham, who referred certain nymphs to this species by supposition, employed as differential characters the length and amount of divergence of the lateral spines of segment 9. The two species discussed here are quite alike in respect to these features, which vary considerably among individuals of the same species.

*Somatochlora semicircularis* (Selys).

I have a teneral imago of this species with the exuvia, taken by Dr. A. G. Huntsman from a pond on Mt. Benson, near Nanaimo, B.C., on July 21, 1909. Dr. Huntsman states that both nymphs and imagoes were common here.

Nymphs (Figs. 26, 27): Eyes rather small, but fairly prominent; frontal ridge with numerous coarse hairs, its front margin gently convexly curved; antennæ with the basal segment slightly shorter and stouter than the second, the third slender and nearly as long as segs. 1 and 2, equal in length to 4.5 and to 6, 7 slightly shorter.

Head but little narrowed behind the eyes, the sides nearly straight and about one-third as long as the posterior margin, which is but little excavated; postero-lateral angles subrectangulate, rather prominent, with numerous hairs.

Labium extending back barely to the bases of the middle legs, apical width of mentum about equal to its length, sides slightly flaring distally; middle lobe moderately deflexed, obtusangulate, the margin minutely crenulate and spinulose; lateral lobes concave within, their inner margin with minute spinules of two or three sizes, distal margin with 9 or 10 well-marked, obliquely-cut, apically rounded teeth, each bearing a tuft of 3 or 4 spinules, of which the innermost is the largest. Mental setæ 10 or 11; lateral setæ 6; end-hook scarcely longer than the second antennal segment.

Lateral margin of pronotum and supracoxal process hairy, the former somewhat produced but rounded, the latter not very prominent.

Legs decidedly short, the hind femora being no longer than the hind wing-cases, rather stout and fringed with moderately long hairs.

Abdomen elongate-ovate, about as wide as the thorax, but little flattened, expanding but little from the broad base to seg. 5, narrowing very slightly on 6 and 7, more rapidly on 8 and 9; lateral margin fringed with hairs, which are long and dense, on 8 and 9; much shorter on the other segments. Lateral spines present only on seg. 9, somewhat less than one-third the length of the segment, slender, subparallel, their sharp tips slightly incurved. Dorsal

hooks wholly absent. Superior appendages triangular, slightly longer than its basal breadth, acuminate, apex slender-pointed; lateral appendages scarcely longer, flattened, their basal breadth nearly half that of the superior appendage, tapering to a point, outer margin gently curved; inferior appendage slender, slightly divergent, extending a little beyond the laterals.

No trace of a colour-pattern is visible in the exuvia.

Measurements.—Length of body 32; abdomen 13.5; hind wing-case 6.3; hind femur 6.3; width of head 6; width of abdomen 8.

The nymphs of this species differ from the other known nymphs of this genus in the absence of any trace of dorsal hooks. The head is much less narrowed behind the eyes, the postero-lateral angles more prominent and angulate and the legs decidedly shorter than in *S. williamsoni* Walk. and *S. metallica* Vand., the only other species of this genus whose nymphs I possess. It differs in the same characters from the nymph of *Cordulia shurtleffi*, to which it bears a considerable resemblance. There seem to be no very good generic characters for the separation of the nymphs of *Somatochlora*, *Cordulia* and *Dorocordulia*.

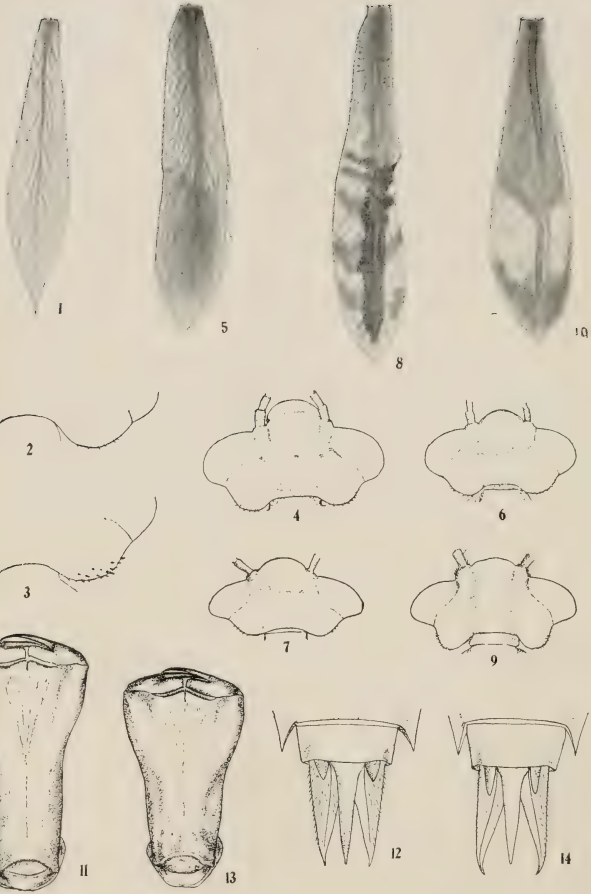
*Leucorrhinia frigida* Hagen.

This species is exceedingly abundant in all swamp waters in the Go Home Bay region, particularly in sphagnum-bogs. We have found the nymphs in large numbers and have reared many specimens.

Needham's description* of the nymph of this dragonfly belongs to another species (probably *L. proxima*). In a letter to the writer he stated that the species had not been reared, but that tenerals of *L. frigida* had been found at the spot where the exuviae were gathered. The nymph of *frigida*, unlike Needham's species, possesses large dorsal hooks like the other species of Leucorrhinia that have been reared.

Nymph (Figs. 21-23) very similar to that of *L. intacta*, but somewhat smaller and the legs slightly slenderer. Head similar to that of *intacta*, except in the somewhat more prominent eyes. Labium of similar size and form, the lateral lobes somewhat more

*Bull. 24, New York State Museum, Ent. 23, p. 196, 1908.

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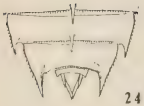
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NEW NYMPHS OF CANADIAN ODONATA.

deeply concave within, the teeth on the distal margin obsolescent, crenate, each with a single spinule; lateral setæ 9 or 10; mental setæ 10-13, the fourth or fifth from the outside longest, the inner four smaller than the others.

Abdomen broadest at seg. 6, scarcely narrowing on 7, slightly on 8, more abruptly on 9; lateral spines on 8 one-half to three-fifths as long as the segment, subparallel, those on 9 reaching about to the tips of the inferior appendages, their inner margins straight and parallel. Superior appendages somewhat less elongate than in *intacta*, acuminate, about twice as long as the lateral appendages. Dorsal hooks on segs. 3-8, larger on 3 and 4 than in *intacta*, less erect and more curved, very slender; those on 5-7 of about the same size as in *intacta* or somewhat larger and slightly more elevated, the curve of the upper margins much stronger proximally, the apices sharp and directed straight back, reaching about the middle of the following segment; on 8 similar to those of the preceding segments but less elevated, directed straight back.

The coloration when well marked is so exactly similar to that of *intacta* that it seems unneccessary to describe it. It is usually, however, rather obscure, though the legs are always distinctly banded.

Measurements. — Length of body 15-16; abdomen 9-10.6; hind wing 4-6-4.75; hind femur 4; width of abdomen 6-6.8; width of head 4.7-4.8.

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## Explanation of Plates I. and II.

Fig. 1. *Nehalennia gracilis*.—Lateral gill.
Fig. 2. *Nehalennia gracilis*.—Hind margin of head.
Fig. 3. *Nehalennia irene*.—Hind margin of head.
Fig. 4. *Enallagma calverti*.—Dorsal view of head.
Fig. 5. *Enallagma calverti*.—Lateral gill..
Fig. 6. *Enallagma hageni*.—Dorsal view of head.
Fig. 7. *Enallagma signatum*.—Dorsal view of head.
Fig. 8. *Enallagma signatum*.—Lateral gill.
Fig. 9. *Enallagma pollutum*.—Dorsal view of head
Fig. 10. *Enallagma pollutum*.—Lateral gill.
Fig. 11. *Boyeria grafiana*.—Labium.

Fig. 12. *Boyeria grafiana*.—Abdominal appendages of female nymph.

Fig. 13. *Boyeria vinosa*.—Labium.

Fig. 14. *Boyeria vinosa*.—Abdominal appendages of female nymph.

Fig. 15. *Neurocordulia yamaskanensis*.—Nymph.

Fig. 16. *Neurocordulia yamaskanensis*.—Terminal abdominal segments of female nymph.

Fig. 17. *Neurocordulia yamaskanensis*.—Lateral view of abdomen.

Fig. 18. *Neurocordulia obsoleta*. — Terminal abdominal segments of female nymph.

Fig. 19. *Neurocordulia obsoleta*.—Lateral view of abdomen.

Fig. 20. *Leucorrhinia intacta*.—Dorsal view of head.

Fig. 21. *Leucorrhinia intacta*.—Terminal abdominal segments of female nymph.

Fig. 22. *Leucorrhinia intacta*.—Lateral view of abdomen.

Fig. 23. *Leucorrhinia frigida*.—Dorsal view of head.

Fig. 24. *Leucorrhinia frigida*.—Terminal abdominal segments of female nymph.

Fig. 25. *Leucorrhinia frigida*.—Lateral view of abdomen.

Fig. 26. *Somatochlora semicircularis*.—Dorsal view of head.

Fig. 27. *Somatochlora semicircularis*.—Terminal abdominal segments of male nymph.

## OBITUARY.

Mr. Franklin A. Merrick died December 16th, 1912, at New Brighton, Pa., at the age of 68 years. He was well known as a diligent and successful collector of Lepidoptera, of which he accumulated a large number of species. Though engaged in business pursuits for a great many years, he found time to devote himself to this Department of Entomology, and maintained a correspondence with others of similar tastes in many parts of the continent. His collection, which was large and valuable, is now in the possession of Dr. Barnes, of Decatur, Ill.

# THE IMPERIAL BUREAU OF ENTOMOLOGY

BY C. GORDON HEWITT, D.SC., DOMINION ENTOMOLOGIST, OTTAWA.

As the question of international effort and co-operation in the matter of controlling and preventing the spread of insects, which in various ways affect human activity, is occupying the attention not only of entomologists, sanitarians and workers directly occupied in studying these many-sided problems, but also of statesmen and administrators, the formation in connection with the British Imperial Service of an Imperial Bureau of Entomology at the beginning of the present year will undoubtedly interest all concerned in these problems by whom the progress and work will be watched.

This organization is not a sudden development, but a gradual outgrowth of efforts along similar lines which began in the spring of 1909. In March of that year a meeting was called by the Secretary of State for the Colonies at the Colonial Office in London, in which the present writer had the honour to take part, to discuss the formation of an Entomological Research Committee for the purpose of furthering entomological research in the British possessions in tropical and sub-tropical Africa. The chief insects which it was considered desirable to study were those associated with the transmission of disease. In 1909 an Entomological Research Committee of the Colonial Office was appointed by Lord Crewe, then Secretary of State for the Colonies, and it consisted of the chief experts in entomology and tropical medicine in Great Britain and Ireland, with Lord Cromer as Chairman. Its work fell under three divisions—namely, the carrying on of investigations and entomological surveys in tropical Africa, for the purpose of which two travelling entomologists were employed; the determination of entomological material and the publication of the work so accomplished, for which purpose the "*Bulletin of Entomological Research*," a quarterly journal, was started. Through the generosity of Mr. Andrew Carnegie, the Committee was able also to undertake the training of Entomologists for service in the Dominions and Colonies.

On account of the valuable service which was being rendered by the Committee to the African Crown-Colonies and Protectorates, suggestions were made for the enlargement of the scope of the work of the Committee. Accordingly, in June 1911, advantage was taken of the presence in England of the Prime Ministers of the

self-governing Dominions, and a Conference was called by the Secretary of State for the Colonies to consider the desirability of further extending the work already begun by securing the co-operation and financial support of the self-governing Dominions and Colonies. By this means mutual assistance could be rendered by the various countries within the British Empire through the medium of a central bureau which would be engaged in the collection and interchange of information in regard to noxious insects. It was unanimously agreed that the establishment of such a central bureau was desirable, as it was realized what valuable assistance it could render in the way of disseminating information and rendering assistance in other ways. Accordingly, a tentative scheme was submitted to the governments of the various self-governing Dominions and Colonies for their consideration.

After due consideration, a further Conference was held at the Colonial Office in August, 1912, to which the government entomologists of the self-governing Dominions and Colonies, and others similarly interested, were invited to discuss and work out a scheme for Imperial co-operation in preventing the spread and furthering the investigation of noxious insects. At this Conference the whole subject was thoroughly discussed, and a proposal was evolved for the establishment of an Imperial Bureau of Entomology to be financially supported by the various Dominions and Colonies and the British Government.

It was proposed that the functions of the Imperial Bureau of Entomology be as follows:

1. A general survey of the noxious insects of the world and the collection and co-ordination of information relating thereto, so that any British country may learn by inquiry what insect pests it is likely to import from other countries and the best methods of preventing their introduction and spread.

2. The authoritative identification of insects of economic importance submitted by the officials of the Departments of Agriculture and Public Health throughout the Empire.

3. The publication of a monthly journal giving concise and useful summaries of all the current literature which has a practical bearing on the investigation and control of noxious insects.

The scheme was accepted by the various self-governing Dominions and Colonies which were invited to co-operate, and the Crown-Colonies and British Protectorates will also participate in the advantages of the Imperial Bureau of Entomology which has now been established. The former Entomological Research Committee has become the Honorary Committee of Management, with the eminent administrator, the Earl of Cromer, as President, and the Scientific Secretary of the Committee, Mr. Guy A. K. Marshall, has been made Director of the Bureau and Editor of the Journal. The Government Entomologists of the Dominions are *ex-officio members* of the Committee of Management.

The publication of the Bureau's journal, which is entitled "*The Review of Applied Entomology*," was commenced in January. It is being published in two parts: Series A, Agricultural; and Series B, Medical and Veterinary. As the organization and library of the Bureau becomes perfected, the value of this journal to entomological workers cannot be overestimated, when it is remembered that there are no less than 1700 periodicals—scientific, agricultural and medical—which may contain articles dealing with entomology, but a small proportion of which widely scattered entomologists have the opportunity of seeing or the time to consult.

An idea of one aspect of the three years' work of the original Entomological Research Committee will be gathered from the fact that the collections received from collectors in tropical Africa and other parts of the world during that time amounted to about 190,000 insects, of which no less than 56,000 were actual or potential disease carriers. The value of this function of the Bureau to entomologists situated in portions of the Empire where there are no collections and little literature to aid them in identification will be realized by their more fortunate fellow-workers.

It has been stated that the Imperial Bureau of Entomology will serve the needs of the British Empire in a manner similar to that in which the United States Bureau of Entomology serves those of the United States. This statement, however, is not correct. Its primary function will be that of an intelligence Bureau, collecting information for the use of British countries supporting it and assisting entomologists and other officials in those countries in the identification of their material. By these methods which have

been mentioned and by the publication of "*The Review of Applied Entomology*," it will furnish a means of assistance and of co-ordination of effort in the war against noxious insects, which will undoubtedly soon make its services invaluable in the further development of the countries, and especially the tropical and subtropical countries, of the British Empire. International, as the scope of its inquiries are, the work of the Bureau cannot but prove to be one of the most potent factors in enabling us to develop the agricultural and other resources of the Empire, and our fellow-workers in non-British countries can avail themselves, throug this journal, of some of the fruits of the Bureau's work.

## GEOMETRID NOTES.—A NEW VARIETY.

BY L. W. SWETT, BOSTON, MASS.

*Therina fiscellaria* Gn., var. *Johnsoni*, Nov.—Expands 30 m.m Fore wings smoky ochreous instead of being yellow as in the normal form. The fore wings are smoky to the basal band, which shows as a bright ochreous line, crossing from costa to inner margin in a regular curve. The mesial space is smoky, with black discal dot showing faintly through. Extra-discal line bright ochreous, curved from costa to median vein, then back sharply in a deep curve to inner margin, as in normal *fiscellaria*. Beyond the wing is smoky black to outer margin. Fringe short and smoky ochreous. Antennæ and head ochreous; body of the same colour. Hind wings smoky ochreous to extra-discal line, which rounds out to a point opposite the black discal spot, the line being ochreous as on the fore wing. Beyond the extra-discal line the wing is smoky to outer margin. The insect, on the whole, seems rather semi-hyaline in appearance, and is no doubt a melanic form. Beneath the fore wings are much lighter than above, with the markings showing through. Hind wings lighter than above, almost a dark fawn colour, with lines showing through from above.

This seems to be a rare form and quite distinct from any described variety. I take pleasure in naming this variety after my kind friend, Mr. C. W. Johnson, who has rendered me valuable help and suggestions.

Type.—1 ♂ from Dr. C. S. Minot, North East Harbor, Me., Sept. 24, 1909, in the collection of the Boston Society of Natural History.

# NOTES ON THE SYNONYMY OF SOME GENERA AND SPECIES IN THE CHLOROPIDÆ (DIPTERA).*

BY J. R. MALLOCH, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

Williston, in his "Manual of North American Diptera," 1908, gives to this family the name Oscinidæ. Unfortunately, the generic name *Oscinis* is a synonym of the earlier name *Chlorops*, as indicated in the following synonymy, so that, even had the name of the family not previously been Chloropidæ, the name Oscinidæ could not be retained. Coquillett, in his paper on "The Type-Species of the North American Genera of Diptera," 1910, made some alterations in the status of certain genera in the family, but some of his conclusions are incorrect. Most European authors refuse to accept Lioy's genera, and of those who have dealt with this family in recent years only Enderlein has recognized any of Lioy's genera as valid. While many of Lioy's genera are synonyms of older genera, and his identifications often obviously wrong, it must be apparent to an unbiased person that wherever it is possible to decide definitely what his genera are, and in all cases he cites species, they must be accepted, provided they are in other respects valid. It seems to me that the acceptance of Meigen's genera included in the 1800 paper, and those of his 1803 paper which had no species included in them, by European writers and their wholesale disregard of Lioy's genera savors slightly of inconsistency. Enderlein, in a paper on the subfamily Oscinosominæ (Sitz. d. Ges. Naturf. Freu, 1911), evidently was unaware of the fact that Coquillett had made use of Lioy's genera in 1910 and retained the generic name *Oscinosoma*, which Coquillett sunk as a synonym of *Botanobia*, and reversed the order as given by that writer. Possibly his reason for using the generic name *Oscinosoma* was to retain as the name of the subfamily one which had as near an approach to the old one (*Oscinis*) as possible. This position might be tenable, even though *Botanobia* has line priority, but for the fact that Coquillett had previously indicated *Botanobia* as the generic name to replace *Oscinis* and gave *Oscinosoma* as a synonym. It is regrettable that these questions of nomenclature occur so often, and that they cause such confusion; but, when they do crop up, it is advisable that they should be settled, and when one under-

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takes to decide a matter of this kind, it is always best to give the reasons why such decisions are arrived at. Having been engaged upon some work on the American species in this family, I find that it is necessary for me first of all to decide upon the correct nomenclature, both of genera and species, before I can publish any descriptive matter or give identifications of species to be used in the publications of the Bureau of Entomology. Thus, I have undertaken the rather unwelcome task of revising the nomenclature of the group, in so far as the American genera are concerned, in the hope that such revision may be of use to other students of the family.

Family Chloropidæ

Subfamily Chloropinæ.

ELLIPONEURA Loew, Berl. Ent. Zeitschr., Vol. 13, 1869, p. 44.
Type: *Elliponeura debilis* Loew.

MEROMYZA Meigen, Syst. Beschr. Zweifl. Ins., Vol. 6, 1830, p. 163.
Type: *Musca saltatrix* Linné.

CETEMA Hendel, Wien. Ent. Zeit., Vol. 26, 1907, p. 98.
*Centor* Loew, Zeit. Ent. Breslau, Vol. 15, 1866, p. 7 (pre-occ.)
Type: *Oscinis cerceris* Fallen.

ANTHRACOPHAGA Loew, Zeit. Ent. Breslau, Vol. 15, 1866, p. 15.
Type: *Musca strigula* Fabricius.

HAPLEGIS Loew, Zeitschr. Ent. Breslau, Vol. 15, 1866, p. 22.
Type: *Chlorops diadema* Meigen.

DIPLOTOXA Loew, Zeitschr. Ent. Breslau, Vol. 15, 1866, p. 31.
Type: *Chlorops versicolor* Loew.

CHLOROPS Meigen, Illig. Mag., Vol. 2, 1803, p. 278.
Type: *Chlorops laeta* Meigen.

Coquillett gives this genus as synonym of *Titania* Meigen, 1800, presumably on the strength of Hendel's representations in his paper dealing with Meigen's genera (Verh. Zool. bot. Ges. Wien., Vol 58, 1908, p. 43), but, as Hendel afterwards points out (Wien. Ent. Zeit., Vol. 29, 1910, p. 312), *Titania* is more probably synonymous with *Gaurax* Loew.

CHLOROPISCA Loew, Zeitschr. Entom. Breslau, Vol. 15, 1866, p. 79.
Type: *Chlorops glabra* Meigen.

EURINA Meigen, Syst. Beschr. Zweifl. Ins., Vol. 6, 1830, p. 3.

This genus has been recorded as occurring in America, but the species included in it from this country is not congeneric with the

type, *Eurina lurida* Meigen. In the National Museum collection the series of *exilis* Coquillett stands among the members of the genus *Chlorops*, having been removed to that genus by Coquillett.

ECTECEPHALA Macquart, Dipt. Exot. Supp. 4, pt. 2, 1851, p. 280.

Type: *Ectecephala albistylum* Macquart.

Subfamily BOTANOBINÆ.

CERATOBARYS Coquillett, Jour. N. Y. Ent. Soc., Vol. 6, 1898, p. 45.

Type: *Hippelates eulophus* Loew.

HIPPELATES Loew, Berl. Ent. Zeitschr., Vol. 7, 1863, p. 36.

Type: *Hippelates plebejus*. Loew.

*Opetiphora* Loew, Dipt. Amer. Sept. Indig. Cent. 10, 1872.

*Siphomyia* Williston, Trans. Ent. Soc. Lond., 1896, p. 418.

CRASSISETA von Roser, Corres. Landw. Ver. Wurtemb., 1840, p. 63.

Type: *Oscinis cornuta* Fallen.

The genus *Elachiptera*, which has as its type *brevipennis* Meigen, does not occur in America, so far as our present information goes.

GAURAX Loew, Dipt. Amer. Sept. Indig. Cent. 3, 1863, p. 35.

Type: *Gaurax festivus* Loew.

*Titania* Meigen, Nouv. Class. Mouch., 1800, p. 35 (Nom. Nud.)

*Macrostyla* Lioy, Atti Istit. Veneto, ser. 3, Vol 9, 1864, p. 1126.

*Titania* has never had any species placed in it and must be considered as "nomen nudum," though there is a possibility that it may have been a species of *Gaurax* Meigen had before him when he wrote the description in his 1800 paper.

MADIZA Fallen, Dipt. Suec, Oscinid., 1820, 8.

Type: *Oscinis oscinina* Fallen.

*Siphonella* Macquart, Hist. Nat., Dipt., Vol. 2, 1835, p. 584.

*Eurinella* Meunier, Bull. Soc. Ent. France, 1893, p. 193.

Coquillett gives *Siphunculina* Rondani, as a synonym also, but this is really the genus afterwards described as *Microneurum* by Becker, which does not at present find a place in the American list.

BOTANOBIA Lioy, Atti Istit. Veneto, ser. 3, Vol. 9, 1864, p. 1125.

Type: *Oscinis dubia* Macquart.

*Oscinis* authors, not Latreille.

*Oscinosoma* Lioy, Atti Instit. Veneto, ser. 3, Vol. 9, 1864, p. 1125.

? *Strobliola* Czerny, Verh. Zool. Bot. Ges. Wien., Vol. 59, 1909, p. 289.

*Oscinella* Becker (Bull. Mus d' Hist. Nat. Paris, 1909, p. 119), Arch. Zool. Budapest, I, 1910, p. 150.

Coquillett accepted *Botanobia* as the name to substitute *Oscinis* Latreille, which had been erroneously used by authors as the generic name for that group, the type of which he indicates as given above. Presumably, he did so because the name appears first in Lioy's paper, though it has only line priority over the one adopted in 1911 by Enderlein, as indicated at the beginning of these notes.

*Botanobia frit*, Linné, Fauna Suec., 1761, p. 1851 (*Musca*).

*Musca hordei*, Bjerk., Vetinsk. Akad. Handl. 34, 1777 (*Musca*).

*Carbonaria* Loew, Dipt. Amer. Sept. Indig. Cent., 7, 1866 (*Oscinis*).

The above synonymy is in accordance with facts ascertained from a comparison of American and European material.

TRICIMBA Lioy, Atti Istit. Veneto, ser. 3, vol. 9, 1864, p. 1125.

Type: *Tricimba linella* Fallen.

*Notonaulax* Becker, Mitth. Zool. Mus. Berlin, 1903, p. 153.

Through Becker disregarding Lioy's work, he did not recognize the fact that that author had clearly defined this genus, and cited as the type of his genus *Notonaulax* one of the two species Lioy included in *Tricimba*.

This genus occurs in America. The species described as *trisulcata* by Adams (Ent. News, Vol. 16, 1905, p. 111) belongs here.

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## A NEW GENUS AND ONE NEW SPECIES OF CHALCIDOIDEA.

BY A. B. GAHAN, MARYLAND EXPERIMENTAL STATION, COLLEGE PARK, MD.

During the summer of 1912 a series of specimens of a Pteromalid were reared by the writer from cocoons of *Cladius pectinicornis* Fourcr. They were found to run readily to the genus *Calopisthia* Foerst. in Dr. Ashmead's "Classification of the Chalcid

Flies." Upon comparison with a specimen in the United States National Museum, of *Cœlopisthia vitripennis* Thoms., one of the two European species of the genus (not the genotype species), they were found to differ materially. Unfortunately, specimens of the genotype species, *C. cephalotes* Thoms., are not available for comparison, but there seems no reason to doubt that this species and *C. vitripennis* are congeneric. A new genus is therefore erected for the reception of the parasite of *Cladius pectinicornis*, which appears to be undescribed.

*Cœlopisthia nematicida* (Pack) Hewitt and *C. diacrisiæ* Crawf., being congeneric with the new species, are also included. *C. fumosipennis* Gahan is a true *Cœlopisthia* and the only described North American representative of that genus. *C. smithii* Ashm. (manuscript name in Smith's Insects of New Jersey, 1900, p. 559) does not belong in the tribe Pteromalini since one mandible is 3-toothed and the other 4-toothed. It therefore falls in the tribe Eutilini and does not appear to fit any genus in that tribe.

The new genus is distinguished from all except *Cœlopisthia* in the tribe Pteromalini by the immargined occiput, non-produced propodeum, subequal stigmal and postmarginal veins, and the long antennal pedicel. From *Cœlopisthia* it may be distinguished as follows:

Both antennal ring-joints elongate, as long or longer than broad; discal cilia of the anterior wings reduced to mere dots or punctures, the hairs obsolete; marginal vein nearly three times as long as the stigmal; abdomen short, rotund. *Cœlopisthia* Fœrster.

First ring-joint strongly transverse, the second as long or nearly as long as broad; discal cilia developed on the apical two-thirds of the wing at least; marginal vein scarcely twice the length of the stigmal; abdomen ovate or conic ovate. . . . *Cœlopisthoidea*, n. g.

CŒLOPISTHOIDEA, new genus.

Head large, much wider than thorax, broad anterio-posteriorly, occiput concave, the occipital forminal depression angularly defined but immargined. Antennæ 13-jointed, inserted on a line with the lower extremities of eyes; scape slender; pedicel longer than the first joint of funicle; two ring-joints, the first transverse, the second elongate, much longer than the first; funicle 6-jointed cylindrical; club 3-jointed, acuminate. Face below the antennæ receding;

mandibles both four-toothed. Parapsidal furrows subobsolete on the posterior half of the mesonotum, impressed anteriorly; scutellum large, moderately convex; propodeum not prolonged into a neck, the median longitudinal carina and lateral folds present, spiracles prominent long-ovate. Wings hyaline, the marginal vein about twice as long as the stigmal, the postmarginal and stigmal subequal, marginal cilia present but short. Posterior tibiæ with one spur. Abdomen sessile, ovate or conic ovate.

Type of genus—*Cœlopisthoidea cladiæ*, n. sp.

KEY TO THE SPECIES OF CŒLOPISTHOIDEA.

1. Postmarginal vein slightly shorter than the stigmal vein. Anterior wings slightly dusky.....*diacrisiæ* Crawf.
   Postmarginal vein not shorter than the stigmal; anterior wings hyaline.
2. Propodeum with a deep circular fovea on either side of the short apical neck; lateral ocelli as far from the eye margin as from each other; anterior wing apparently without marginal cilia.....*nematicida* Pack.
   Propodeum without deep fovea either side of the apex; lateral ocelli as close to the eye margin as to the anterior ocellus, much closer to the eye than to each other; anterior wings with weak marginal cilia on the posterior margin toward the apex.....*cladiæ*, n. sp.

*Cœlopisthoidea cladiæ*, n. sp.

*Female.*—Length about 2.5 mm. Head and thorax æneous, closely reticulate-punctate; scape reddish testaceous, the pedicel and flagellum dark brown, pedicel longer than the two ring-joints and first joint of funicle combined, first ring-joint transverse, second as long as broad; funicle joints not longer than broad, the apical ones not as long as broad; club acuminate, three-jointed, the joints about as long as the funicle joints. Ocelli in an obtuse angled triangle, the lateral ocelli nearer the eye margin than to the anterior ocellus.

Punctures of the mesoscutum somewhat smaller and deeper than those of the head, apical portion of the scutellum differently sculptured from the anterior portion, giving the appearance of a transverse line before the apex; true metanotum punctate; propodeum punctate, the lateral folds distinct and complete, median

carina also well defined, spiracles long-ovate and prominent; neck of the propodeum short, smooth and shining and without a distinct circular depression either side. Wings hyaline, the postmarginal as long as the marginal, marginal cilia of the anterior wings absent, except for a very few weak cilia on the posterior margin toward the apex; basal portion of the anterior wing to the apex of the costal cell hairless, except for a single row of hairs in the costal cell, remainder of the wing ciliate but with the hairs very short. Anterior and posterior coxæ more or less metallic on the outer side; median pair brownish; all trochanters, femora, tibiæ, and tarsi pale testaceous, the femora and tibiæ tinged with brownish. Abdomen ovate, pointed at the apex, smooth and shining, dark brown, with the basal segment metallic.

*Male.*—Coloured like the female, but a brighter green, with stronger reflections; antennæ shorter than in the female, the joints of the funicle not as long as broad, the club short and compact.

*Type locality.*—Upper Marlboro, Prince George County, Md.

*Host.*—*Cladius pectinicornis.*

*Type.*—Cat. No. 15,506, United States National Museum.

Thirty females and three males in the type series. The type and several paratypes deposited in the United States National Museum. Remaining paratypes in the collection of the Maryland Experiment Station, College Park, Md.

Mr. E. N. Cory, of this Department, brought me several pupæ of the sawfly which he had secured on rose bushes at the farm of Mr. R. S. Hill, Upper Marlboro, Md., August 6, 1912. At the same time he turned over to me a single live female of the parasite which he had taken crawling over the sawfly cocoons. This parasite and the sawfly cocoons were placed together in a vial on my desk. The parasite died and was pinned August 12, without having been observed to oviposit. August 19 there emerged in the vial thirteen specimens of the parasite. Examination of the cocoons on this date showed that all these parasites had come from a single sawfly pupa. One of the remaining cocoons was found to be packed full of the naked pupæ of the parasite, which at this time were pale-yellowish, with the eyes dark-red, and measured a little over 2 mm. in length. August 27th, adults to the number of 20 emerged from this lot of pupæ. While proof is lacking, it seems

probable that this last lot of parasites were from eggs deposited by the captured female, either just before or shortly after her capture. *C. nematicida* is said by Hewitt* to be able to develop from egg to adult within a period of twenty-three days.

## SPECIES OF LEPIDOPTERA NEW TO OUR FAUNA, WITH SYNONYMICAL NOTES

BY WM. BARNES AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In working over some material in the Barnes Collection we have come across several species unrecorded from the United States. As the localities are authentic, we think it wise to note their occurence. We are indebted to Dr. Skinner for several of the determinations.

*Diurnals.*

*Synchloe endeis* G. & S.

Synchloe endeis Godman & Salvin, Ann. Mag. Nat. Hist., (6) XIV., p. 97; id., Biol. Cent. Am. Rhop., II., 673, Pl. 108, figs. 5 and 6 (1901).

We have before us 1 ♂ labelled "Texas" and 1 ♀ much worn from Edwards Co., Texas, May 1902, received from Mr. H. Lacey, of Kerrville.

*Myscelia ethusa* Bdv.

Cybdelis ethusa Boisduval in Cuv. Rig. An. Ins. Atl. II., t. 138, fig. 3.

Myscelia cyanecula Felder, Reise Nov. Lep. 408, t. 53, f. 5.

Myscelia ethusa Godman & Salvin, Biol. Cent. Am. Rhop. I., p. 232 (1883).

One very perfect ♂ specimen from Brownsville, Texas, captured Oct. 15th.

*Lasaia agesilas narses* Staud.

Lasaia narses Staudinger, Exot. Schmett. I., p. 257 (1888); Stichel, Berl. Ent. Zeitsch. 55, p. 48 (1910); id. Gen. Insect. Riod., p. 187 (1911).

Two specimens from Brownsville, Texas, April 11th and June 11th (G. Dorner). We have not seen the original description of this species; but, according to Stichel's short diagnosis, they would seem to be best placed under this name. They certainly do not

*CANAD. ENT., XLIII., 1911, p 302.

agree very well with the figure in the Genera Insectorum of *sula* Stdr. which Stichel records from Texas.

*Thecla pastor* Butl. & Dru.

Strymon pastor Butler & Druce, Cist. Ent. I., p. 105.

Thecla pastor Godman & Salvin, Biol. Cent. Am. Rhop. II., 34, Pl. 52, figs. 8–10.

Five ♂s and one ♀ from Brownsville, Texas, (May–June). The brown marginal lunules of secondaries on under side point to this species, but the subterminal white broken line is stronger in our specimens than in the figure in the Biologia.

*Thecla azia* Hew.

Thecla azia Hewitson, Ill. Diur. Lep. 144, Pl. 57, figs 357-8; Godman & Salvin, Biol. Cent. Am., Rhop. II., 91.

One ♀ from Paint Creek, Edwards Co., Texas, received through Mr. H. Lacey. The red marginal line of under side of both wings is characteristic; the species is related to *clytie* Edw., but is without doubt distinct.

*Thecla cestri* Reak.

Thecla cestri Reakirt, Proc. Acad. Phil. 1866, p. 338. Godman & Salvin, Biol. Cent. Am. Rhop., p. 96, Pl. 58, figs. 12-13.

One ♀ from Brownsville, Texas, Oct. 15th (G. Dorner). The maculation of the underside of secondaries is brown, rather than black, as given by Godman & Salvin; but more material is needed before deciding whether the Texan form represents a geographical race or good species.

*Cogia calchas* H. S.

Eudamus calchas Herrich Schaeffer, Prodr. III., p. 68 (1868).

Cogia calchas Godman & Salvin, Biol. Cent. Am. Rhop. II., p. 340.

A series of both sexes from Brownsville, Texas, and San Benito, Texas, taken in July and October, is before us.

*Xenophanes tryxus* Cram.

Papilio tryxus Cramer, Pap. Exot. Pl. 334, figs. G. H.

Xenophanus tryxus Godman & Salvin, Biol. Cent. Am. Rhop. II., p. 387.

Two ♂s and two ♀s are before us, collected at Brownsville, Texas, in May and July.

*Noctuidæ.*

*Oxycnemis dunbari* Harv.

Hadena dunbari, Harvey, Can. Ent. VIII., 52 (1876).

Litholomia dunbari, Smith, Bull. 44, U.S.N.M., 226 (1893).

Oxycnemia definita Barnes and McDunnough, Cont. Nat. Hist. N. Am. Lep., I, (5) 17, Pl. II., fig. 3 (1912).

Mr. Wolley-Dod recently called our attention to the fact that our *definita* was probably synonymous with *dunbari* Harv. An examination of Harvey's type in the Edward's Coll. by Dr. Barnes showed a strong claw on fore tibia, which had evidently been overlooked by Smith, and confirmed Dod's suspicions. The species certainly is no *Litholomia*; we place it doubtfully in *Oxycnemis* for the present. Hampson's figure, which misled us, (Cat. Lep. Phal., pl. 100, fig. 31) does not represent this species at all, but is a strongly marked form of *napaea* Morr.

*Ozarba fannia* Dru.

Eustrotia fannia Druce, Biol. Cent. Am. Het. I., 313, Pl. 29, fig. 12 (1889).

Ozarba fannia Hampson, Cat. Lep. Phal. X., 451 (1910).

Numerous specimens before us from San Antonio, Texas, Black Jack Spgs., Texas, and Kerrville, Texas, agree with Hampson's generic definition and correspond fairly with Druce's figure. The species had been misidentified for us by J. B. Smith as *Thalpochares ætheria* Grt., which, according to Hampson, who has the type before him, is generically distinct.

*Eustrotia catilina* Dru.

Eustrotia catilina Druce, Biol. Cent. Am. Het. I., 312, Pl. 29, fig. 5 (1889); Hampson, Cat. Lep. Phal. X., p. 598 (1910).

One ♂ and two ♀s from Shovel Mt., Texas; San Benito, Texas; Texas (Rauterberg).

*Palindia micca* Dru.

Palindia micca Druce, Biol. Cent. Am. Het. I., 319, Pl. 29, fig. 5 (1889).

A single ♂ in very fresh condition from San Benito, Texas, corresponds well with Druce's figure; shows, however, only traces of the terminal dark shading.

*Megalopygidæ.*

*Megalopyge lapena* Schaus.

Megalopyge lapena Schaus, Jour. N.Y. Ent. Soc., IV., 58 (1896).

Gasina lapena Druce, Biol. Cent. Am. Het. II., p. 432, Pl. 86, fig. 13 (1897).

Three ♂'s and one ♀ of this species, taken in Chiricahua Mts., Ariz., and Palmerlee, Ariz. (Aug.), are before us.

*Pyraustinæ.*

*Edia semiluna* Sm.

Lythrodes semiluna Smith, Can. Ent. 37, p. 67 (1905).

Cynaeda bidentalis Barnes & McDunnough, Cont. Nat. Hist. N. Am. Lep. I, (5) 33 (1912).

Edia microstagma Dyar, Proc. U.S. Nat. Mus. 44, p. 320 (1913).

A recent study of the unique type of *semiluna* Sm. proves conclusively that Smith's generic reference was faulty, as the species is a Pyraustid and identical with *bidentalis* B. & McD. There seems but little doubt that Dyar has redescribed the same species, creating the new genus *Edia* for its reception; as a new genus is probably necessary, the synonymy will be as stated above.

*Noctuelia castanealis* Hlst.

Orobena castanealis Hulst, Tr. Am. Ent. Soc. XIII., 157 (1886).

Thalpochares jativa Barnes, Can. Ent., 37, p. 213 (1905).

An examination of the type specimen of *jativa* shows it to be a Pyraustid and, without much doubt, identical with *castanealis* Hlst., although we have not seen the type of this latter species.

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Mr. Norman Criddle, of Treesbank, Manitoba, has been appointed a Field Officer of the Division of Entomology, Ottawa, to carry on investigations in Southern Manitoba.

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Mr. L. S. McLaine, M. Sc., has been appointed a Field Officer of the Division and is now engaged, through the courtesy of Dr. Howard, in the rearing and collection of the parasites and predaceous enemies of the Brown-tail and Gipsy Moths in Massachusetts, in connection with the work of establishing the same in New Brunswick.

## FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 134.)

378. *Parastichtis discivaria* Walk.—This species is correctly named, and Sir George Hampson changed his opinion as to the distinctness of *gentilis* before publishing. Walker's type is from St. Martin's Falls, Hudson's Bay Territory, and is the strongly marked contrasting form, with pale luteous inner and postmedial areas. Type *perbellis*, from Evans Centre, N.Y., which Hampson makes "ab. 1." is similarly strongly marked, but more even in shade, and lacks the contrastingly pale areas. This is the form figured by Holland. *Gentilis*, from the same locality, is even red-brown, with indistinct maculation. All three forms occur here, and intergrade.

381. *Homoglœa hircina* Morr.—This has been rather common in recent years. I have never seen it in the fall, but it appeared in some numbers in the end of March, 1910, which I thought unusually early. This year however a few were seen at light during a mild spell on the 4th or 5th of March. A fortnight later the thermometer fell to about 15° below zero. It is a strikingly variable species, some of the forms being very pretty. The colour varies from a rather pale reddish luteous to dark chocolate brown. A handsome grey irroration is variably present or absent. Some are practically immaculate; others have the usual geminate cross lines of darker shades filled in with the ground colour, or with grey, the spots also sometimes outlined with grey. Sometimes most of the veins are grey lined. A rare form has black punctiform spots in the s.t., and still more rarely in the t.p. line also. A well defined median transverse shade sometimes exists, and generally runs through the middle of the reniform.

383. *Ipimorpha pleonectusa* Grt.—The type in the British Museum is a male from Evans Centre, N. Y. according to the Catalogue, and the eastern form seems to have reddish brown tints not possessed by specimens from Manitoba and Alberta, which Hampson makes "Ab. 1. Paler, and less red." Dr. Dyar, in the Kootenai List, says that both forms occur at Kaslo, and calls the light clay-coloured one "var. *æquilinea* Smith." Smith refers to

this as a mere synonym in his Catalogue, but I have seen neither type nor description.

384. *Dasyspoudœa meadii* Grt.—High River (Baird).

385. *Copablepharon sp.*—This is not *absidum*, nor apparently any described species. I have seen a few other specimens besides the two previously referred to, but have only a single female in my collection, and do not care to describe from it. Mr. Baird has taken it at High River, and I have also seen a female taken by Mr. C. Garrett in Calgary on Aug. 1st, 1907. The primaries are very pale green, with slight fuscous irroration, and secondaries white, fuscous clouded centrally.

388. *Melaphorphyria oregonica* Hy. Edw.—*Oregona* of our lists is apparently a mis-spelling, as was also my previous rendering (Dr. Dyar's) of the generic name.

389. *Melicleptria septentrionalis* Hy. Edw.—Hampson makes this synonymous with European *ononis* Schiff. The type of *septentrionalis* is a male in the Neumœgen collection at Brooklyn, and is labelled "N.W.B.C."

390. *Heliaca nexilis* Morr.—Rather common at timber line in the mountains. My records are: Brobokton Creek, Wilcox Pass, and Sheep Mountain, July 10th to 22nd (Mrs. Nicholl); Mt. St. Piran, near Agnes Lake, Laggan, 72-75,000 feet, July 17th and 18th. This is the *nexilis* of the British Museum, Rutgers College, and Washington collections.

Var. *elaborata* Hy. Edw.—One male, Head of Pine Creek, June 9th, 1897. High River, June 10th, 1909, two ♀s (Baird). I have seen other specimens taken by Mr. Baird. This form is the *diminutiva* of my former notes on Smith's authority. The error was excusable, as the two are not unlike. But *diminutiva* has truncate frontal prominence, which this has not, and differs in colour and maculation as well. Holland's figure under *diminutina* appears to be *Melicleptria persimilis* Grote, a species with rounded frontal prominence and spined tibiæ. Superficially *persimilis* happens to bear a much closer resemblance to *elaborata* than to *diminutiva*, but has an additional white spot near base of secondaries.

One of my *elaborata* I have compared with the type, a Colorado female in the Henry Edwards collection. The main features in which it differs from what I take to be the true *nexilis* is that the head, thorax and primaries are strongly overlaid with yellowish, giving the impression, against the black ground, almost of bronzy green. In my three specimens, in addition to the yellowish or whitish band on primaries, there is a small yellowish mark in the cell before the orbicular. There is a trace of this in one only out of my ten mountain *nexilis*, and I notice it exists in Hampson's wood-cut of *nexilis*. After describing *nexilis*, Sir George Hampson gives "Ab. 1. *elaborata*, fore wing without the white spot in cell before the reniform." This is not in accordance with my notes on the type in the New York Museum, but I may possibly have overlooked this difference, which my specimens do not have. Several of my mountain *nexilis* lack this spot. In the British Museum collection an *elaborata* label is placed beside a Washington Forest Reserve specimen, which I should have called typical *nexilis*.

For a long time I was inclined to consider *elaborata* distinct, as I found it hard to believe that a species should occur here on the plains, and in the mountains, in so far as I had observed, at the timber line only. All the B.C. records I can find appear to be from mountains, elevation not given. So closely does *elaborata* resemble *persimilis* that I suspected the existence of tibial spines in the former. But I recently removed, bleached and mounted all the legs of my whole series of *nexilis* and *elaborata* without succeeding in finding a single spine on any tibia. I must admit that the differences between these two latter, such as they are, are very slight, and the observed variation suggests that with more material the forms may be found to overlap. What has made the matter still more interesting is that Mr. A. F. Winn and others have recently discovered *nexilis* at St. Hilaire, which is close to sea level in Quebec. I am indebted to Mr. Winn for a specimen, and except that it has rather less pink on secondaries beneath, it is practically a dead mate for one of my Mt. St. Piran timber line specimens. In Quebec, Mr. Winn says that the species flies in the middle of May. That is two months earlier than the mountain dates, but is probably easily explained by the altitude.

391. *Polychrisia trabea* Smith.—During 1910 I took this species in some numbers at flowers of wild larkspur, on which the larva in all probability feeds.

392. *P. purpurigera* Walk.—Edmonton, July 14th, 1910 (F. G. Carr.)

395. *Euchalcia putnami* Grote.—The type is a female in the British Museum. There I found North American and European specimens associated as one species under the name *festucæ* Linn, and my notes say that the reference is apparently justified, as the European species varies to *putnami*. As a rule, the European form is darker and richer in colour and has a golden metallic spot at the base of the costa which *putnami* generally lacks. Another character not usually found in *putnami* is a metallic outer edging to the t.a. line below the median vein. In *putnami* the two central metallic spots are sometimes joined. I am not sure whether this is ever the case with *festucæ*. At any rate, such variation is rare in Europe. Vancouver Island specimens vary very much nearer to typical *festucæ* than do my local series. Some have the rich dark coloration, the metallic marks at base, and on the t.a. line; but the inner one of the two central spots less frequently extends a little above the median vein than it does in Alberta specimens, or than appears to be the case in *festucæ*.

398. *Autographa californica* Speyer.—The most important distinctive mark between this species and *pseudogamma* I had overlooked in my previous paper. *Californica* has a fine black longitudinal streak anterior to the subterminal line near the apex, which usually reaches, or very nearly reaches, the t.p. line. In *pseudogamma* this streak is non-existent. It exists in *ou*, which resembles *californica* rather closely in pattern, though unquestionably distinct. As *ou* has quite recently been added to the Canadian list, on the strength of a specimen taken at Aweme by Mr. Criddle, a comparison with *californica* may be of special interest. In *californica* the t.p. line is somewhat deeply sinuate near the inner margin. If viewed with the outer margin of the wing upwards, that portion of the line below vein 2 has the shape of a written "n" with the top of the first stroke rather pointed. In *ou* this portion of the line is very slightly waved only. In *californica* the sign is usually

of the well-known Greek "gamma" form, but is sometimes formed of two separate marks. The inner one is roughly V-shaped, with the strokes out-curved. The outer mark is a lobe-shaped dot, which joins or tends to join the V at its apex—that is, at the point nearest the inner margin of the wing. In *ou* the inner mark is more U-shaped, and the outer spot is approximate to, and sometimes joins, it at a point nearest the outer margin. There are other differences in colour and maculation, but these are the most obvious. The difference in the sign is well shown in Ottolengui's figures. As a matter of fact, I find the signs in many Autographas much more variable than I had been led to suppose from first perusals of Ottolengui's paper. The most obvious structural differences between these two species is that *ou* has hind tibiæ strongly spined, whilst *californica* has not.

Holland has his figures of the above three species badly mixed. On plate XXVIII., fig. 25, as *rogationis*, represents *ou*, whilst fig. 33, called *ou*, is of *pseudogamma*, and fig. 35, called *pseudogamma* is obviously *californica*.

The question as to the true status of closely allied forms separated by wide stretches of ocean will probably always give rise to controversy. The best way of dealing with the matter is probably to treat such forms as distinct, unless exactly similar specimens can be found on both continents. I am not aware that similar specimens have been found of our *californica* and European *gamma*, and therefore prefer to treat them as distinct. One difference in pattern appears to be that the upper portion of the t.p. line is more crenate in *californica*. All the maculation in our species is more clearly written, and shows greater contrasts. *Gamma* has the black streaks near the apex, but it is less developed than in *californica*. The sign is about similar in the two, and both have unarmed tibiæ. But in general color of primaries *gamma* is darker and more even, and much more like normally coloured *ou*.

Grote in Can. Ent. XXXV., p. 238, Aug. 1903, states that *ou* and *fratella* are distinct species, and that any confusion between them arose from misidentification of *ou*. In his 1905 list he places *californica* and *russea* as varieties of *ou*. The type of *russea* from

Colorado is in the Henry Edwards collection, and is a reddish *californica*. That of *fratella*, as well as *ou*, is in the British Museum, and I was satisfied that they were one species. *Fratella* is undersized. The type of *ou* had either no hind legs or they were so tucked up in the vestiture that I had no chance of finding spines.

401. *A. rubidus* Ottol.—I have six more local captures of this species in my collection, dated June 1st to July 5th, 1909 and 1910. It comes to light and treacle, and I have taken it on the wing after dark flying over vetches. I took six specimens during 1909 alone, five of them at treacle. The tail of the sign is not always produced to a point as in Ottolengui's figure of the type. It sometimes widens out into a slight lobe, rather like that of *californica*. On the other hand, I have *californica* in which the tail is much like that of the type of *rubidus*. The nearest well-known relation to *rubidus* is *precationis*.

402. *A. alias* Ottol.—I have only four Alberta specimens in my collection which I feel quite certain are this species. The Waghorn (Blackfalds) specimen previously referred to, a ♀ with ♂ abdomen attached, July 25th, 1902. A ♂ and two ♀s, Head of Pine Creek, Aug. 7th, 9th and 16th, 1897 and 1903. They agree with Ottolengui's figures, and have the sign nearer to that of *rectangula* than any other species, but not as heavy. In fact, *alias* is the nearest ally that *rectangula* has. Also taken at Banff, Aug. 4th, 1908 (Sanson).

I long hesitated in separating from this a form which I have been calling *octoscripta*. I have a local female, dated Aug.21st, 1903, and another from Mr. Wallis, Winnipeg Beach, Man., Aug. 23rd, 1910. The latter specimen is almost the exact counterpart of Ottolengui's figures. Mr. Wallis showed me another female taken at the same place, Aug. 22nd. I have also given this name to a Banff male, one of Mr. Sanson's captures, August 1910. This has a more spider-like sign than any of the others. I have a male from Cowichan Bay, near Duncans, Vancouver Island, which is brighter coloured and has heavier sign, but which I think is the same. It resembles *alias* very closely in colour and general pattern, but is

rather darker. It has the irregular dentate terminal line of that species and *rectangula*, and the short blackish streak between that and the s.t. line opposite the reniform, of which there sometimes seems to be a trace in the other two species. The sign seems to be a modification of that in *alias*, which fact for long caused me to associate the two. As Grote describes it, it is "incompletely S-shaped, open superiorly." The outer portion of the S, however, seems sometimes to be a solid dot. The inner portion opens wide like that in *alias*, but is more thread-like. Other differences perhaps distinctive, appear to be that the t.a. and t.p. lines are more direct and less distinct. The t.p. line is, as Grote puts it, "waved or trembled, and appearing thus a distinguishing feature from Guenée's species" (*mortuorum*, *rectangula*). In *rectangula* and *alias* this line is scarcely crenate, but rather obviously waved. In *octoscripta* it is minutely but distinctly crenate, and but very slightly waved. I have carefully studied Grote's description, and the series standing under the name in the British Museum, and must for the present consider this Western form as dark and heavily marked *octoscripta*.

The British Museum series consists of six specimens—all very much alike, and looking somewhat bleached. There are two poor males, Nova Scotia (Redman), one of them badly rubbed. A pair, Grote collection, the male "Can." (This specimen was still unset when I saw it.) Two males, Hudson's Bay. The Grote collection females have two blue-bordered labels in Grote's handwriting—both "*Plusia 8-scripta* Sanb.," the upper label with "M.S." after the name. Whether this is really the type or not I cannot say. They are smaller than mine, as well as paler, and have the sign very thread-like, and similar in the whole series.

The description was published only by Grote, and the name should therefore be credited to him, though he used Sanbourne's Mss. name. The type specimens, number not stated, came from "Anticosti Island (Couper); Racine (O. Meske); Mass. (Prof. Packard)."

(To be continued.)

# APPERCEPTIONAL EXPECTANCY AS A FACTOR IN PROTECTIVE COLORATION.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

It is a matter of common knowledge that many insects escape detection by reason of their resemblance to certain surroundings. *Conotrachelus nenuphar* Hbst., which drops to the ground when disturbed, resembles bits of soil so closely that it often escapes observation. Certain moths resemble the bark upon which they rest; many caterpillars resemble the foliage upon which they feed; in fact, such resemblances are almost too numerous to mention.

This phenomenon is known as protective coloration, and is usually dismissed without further thought. Upon analyzing it further, however, it is evident that other factors contribute toward the result obtained by the perception of such an insect amid such surroundings, or, in fact, any surroundings. The perception of an insect is modified by associated perceptions from adjoining surroundings. A perception of a colour received, for instance, from a butterfly's wing will depend in part upon other perceptions received at the same time from adjoining surroundings or adjoining parts of the butterfly.

In addition to sensation, which is the result of stimulation upon the organ of sight by the object in question, perception is also determined by apperception, which is the contribution of the mind from previous experience. In other words, the mind also contributes something which helps to form the complete mental content. A red background, for instance, arouses an apperceptional expectancy for red, a green background an apperceptional expectancy for green, and so on. Many green insects are rendered less conspicuous and sometimes inconspicuous against a green background by reason of this expectancy on the part of the observer. Without this expectancy factor such insects would be more conspicuous than they are. When a protectively coloured insect is removed from its surroundings, and both surroundings and insect viewed separately, the sensations are quite distinct.

Many trained observers, and, in fact, numerous birds, are able to overcome this expectancy, and as a result discriminate

such insects from their surroundings, although such discrimination may be due in part to an ability to perceive form. By reason of this apperceptional expectancy many insects also appear more conspicuous amid certain surroundings than others.

TABLE SHOWING THE EFFECT OF COLOURED BACKGROUNDS UPON INSECTS, THE COLOUR NEAREST THE NAME BEING THAT AGAINST WHICH IT IS MOST CONSPICUOUS, THE FOLLOWING COLOURS BEING ARRANGED IN THE ORDER APPROACHING INCONSPICUOUSNESS :

| | | | | |
|---|---|---|---|---|
| *Colias philodice* Gdt. . . . . | blue | red | green | yellow |
| *Danais plexippus* Linn. . . . . | yellow | green | blue | red |
| *Pyrameis atalanta* Linn. . . . . | yellow | green | blue | red |
| *Plathypena scabra* Fab. . . . . | yellow | green | red | blue |
| *Mamestra trifolli* Rott. . . . . | yellow | red | blue | green |
| *Anasa tristis* DeG. . . . . | yellow | green | red | blue |
| *Murgantia histrionica* Hahn. | yellow | green | red | blue |
| *Arilus cristatus* Linn. . . . . | yellow | green | red | blue |
| *Cyllene robiniæ* Forst. . . . . | yellow | green | red | blue |
| *Rhynchites bicolor* Fab. . . . . | yellow | green | red | blue |
| *Polistes variatus* Cress. . . . . | yellow | green | red | blue |
| *Eristalis tenax* Linn . . . . . | yellow | green | red | blue |

With most of the above species, at least, it is noticed that yellow is more or less a fatal background, as far as inconspicuousness is concerned. Green is less fatal, but it is only in the red and blue that anything like protection is gained.

The more the coloration of an insect approaches that of its surroundings, the less conspicuous it becomes, but in all cases apperceptional expectancy tends to make this inconspicuousness more complete, and, as a result, more protective.

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DR. C. GORDON HEWITT, Dominion Entomologist, was elected a Fellow of the Royal Society of Canada at the recent meeting. He was also chosen to represent the Royal Society at the forthcoming Jubilee of the Entomological Society of Ontario.

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DURING the months of June, July and August the editor will be away from the city. Manuscripts for publication may be sent to Mr. A. F. Winn, 32 Springfield Ave., Westmount, Que.

## BOOK NOTICE.

"The Importation Into the United States of the Parasites of the Gipsy Moth and the Brown-Tail Moth: A Report of Progress, with some consideration of previous and concurrent efforts of this kind." By L. O. Howard and W. F. Fiske. Bull. 91, Bureau of Entomology, U.S. Dept. of Agriculture, 344 pp., 27 plates, 74 text figs., 3 maps. July, 1911.

Perhaps no recent entomological undertaking has been watched with greater interest by American and Canadian entomologists than the attempt to establish on the American Continent the natural enemies of the Gipsy and Brown Tail Moths. This interest is due to two things: the immense destruction caused by the two insects in Massachusetts and the southern portion of New Hampshire and Maine, and to the fact that it is the first serious attempt to introduce all the effective insect enemies of a Lepidopterous host from one country, or series of countries, into another that has been made in the history of entomology.

The story of the work of introducing these insect enemies, together with that of previous and concurrent efforts of the same nature, is, as the title indicates, told in the Bulletin under consideration.

The first part consists of a discussion of previous work in the practical handling of natural enemies of injurious insects. It is an able discussion including many original and valuable observations. It presents, for the first time, a comprehensive view of the results that have attended the artificial transportation of insect parasites of various hosts in different quarters of the globe.

The second part tells the story of the introduction into the United States of the natural insect enemies of the Gipsy and Brown Tail Moths. The reasons for attempting the work are given at length, and the main issues of the experiment are fully discussed. Biological and other notes on a small army of parasites are recorded. Although the discussion is primarily that of the parasites of two Lepidopterous hosts, yet, on account of the fact that the author brings to bear upon the subject a splendid grasp of the broad subject of insect parasitism, it has a wide biological significance.

The sections on "Studies in the Parasitism of Native Insects" and "Parasitism as a Factor in Insect Control" are particularly interesting. To attempt, however, to pick out the most interesting and valuable portions of the work would be fruitless, as there is scarcely a paragraph that is not well worth reading.

A limited supply of the Bulletin was distributed in July, 1911. A general distribution has, however, only recently been made.

Since its publication a short article on "The Gipsy Moth as a Forest Insect," by the junior author, has appeared as Circular No. 164, U.S. Bureau of Ent. Speaking of the results of parasite importation, Mr. Fiske says: "On the whole, the results are decidedly satisfying, and the State of Massachusetts and the United States Department of Agriculture have no cause to regret having undertaken the unexpectedly formidable task of parasite importation. Within a territory entering a little to the northward of Boston, it may be conservatively stated that fully 50 per cent. of the eggs, caterpillars, or pupæ of the Gipsy Moth, in the aggregate, were destroyed by imported parasites in 1912." It is Mr. Fiske's opinion that this present rate of mortality in the central portion of the infested territory will eventually be considerably increased and will extend itself over the entire area of infectation.

In speaking of the amount of additional control necessary to check the increase of the Gipsy Moth in America, it is stated in Bull 91, p. 117, l. 11, that "An aggregate parasitism of 85% will almost certainly be sufficient, and it may well be that 80%, or even 75%, will answer equally well. Much less than 75% will probably not be effective."

In conclusion, it may be said that the Bulletin contains a wealth of information on a subject that has hitherto been little understood. It treats of a strictly scientific subject in a scientific way, and has the merit of being written in a particularly attractive style. It will be indispensable to any entomologist interested in natural control of insects. The excellent illustrations, of which the majority are original, materially enhance the permanent value of the work. J. D. TOTHILL.

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Mailed June 7th, 1913.

The Canadian Entomologist.

Vol. XLV. LONDON, JULY, 1913 No. 7

# REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (TIPULIDÆ), WITH A KEY TO THE SPECIES OF PTYCHOPTERA.

BY CHARLES P. ALEXANDER, ITHACA, N.Y.*

An extensive collection of Japanese crane-flies, taken by Dr. S. I. Kuwana and assistant entomologists in the vicinity of Nishigahara, Tokio, Japan, during the season of 1912, was forwarded to me for examination. The material, alcoholic, is contained in 62 vials, very carefully prepared and with complete data. I express my sincere thanks to Dr. Kuwana and his assistants for this fine representation of Japanese Tipulidæ and Ptychopteridæ.

*Family Ptychopteridæ*

Genus *Ptychoptera* Meigen.

*Key to the species of Ptychoptera.*

1. Wings with a distinct brown cross-band along the cord . . . . . 2
   Wings hyaline or subhyaline without a distinct brown cross-band along the cord.

2. Radial sector more than twice as long as the radio-median cross-vein. (Europe) . . . . . *contaminata L.*
   Radial sector rarely longer than the radio-median cross-vein. . . 3

3. Posterior metatarsus conspicuously white. (Europe). . . . . *albimana* Fabr.
   Posterior metatarsus not white.

4. Pleuræ reddish yellow; a short brown cross-band near the middle of the radial cell. (East. U.S.) . . . . . *rufocincta* O.S.
   Pleuræ black; no brown cross-band near the middle of the radial cell . . . . . 5

5. All coxæ yellow or reddish-yellow; scape of antennæ brownish-yellow or yellow . . . . . 6

* Contribution from the Entomological Laboratory of Cornell University.

Fore coxæ yellowish, other coxæ black; scape of antennæ black. (Japan)..... *japonica*, sp. n.

6. Scutellum yellow. (Europe)..... *lacustris* Meig.
Scutellum black.....7

7. Abdomen with the basal third of the second segment and the basal one-half of the third segment reddish orange. (India)..... *distincta* Brun.
Abdomen entirely black. (Europe)..... *paludosa* Meig.

8. Femora and tibiæ bright orange-yellow, tarsi coal-black. (Abdomen orange-yellow, tergites with blackish borders to the segments; sternites orange-yellow.) (India)..... *atritarsis* Brun.
Femora and tibiæ more or less black or brown; tarsi not coal-black.....9

9. Pleuræ silvery-white.....10
Pleuræ not white. Thorax different in colour in the two sexes; femora bright yellow, hind pair black on the basal two-thirds except the extreme base. (India)..... *tibialis* Brun.

10. Hind coxæ black except at tip; femora brown at tip; scutellum reddish; hypopygium large, reddish; first segment of the antennæ reddish. (West. U.S.)..... *lenis* O. S.
Coxæ and femora yellow, the latter black at the tip; scutellum yellow; hypopygium small, mostly blackish; antennal scape black. (Europe)..... *scutellaris* Meig.

*Ptychoptera japonica*, sp. n.

Wings banded; radial sector very short; antennæ of the male very long, about as long as the body; abdomen with little reddish or yellowish colour.

Male.—Length, 8.5 mm; wing, 8.9 mm; antennæ, 8.4 mm.; fore leg, femur, 5.4 mm.; tibia, 5.4 mm.; tarsus, 8 mm.; middle leg, femur, 5.4 mm.; tibia, 5.1 mm.; tarsus, 7 mm. Hind leg, femur, 6.1 mm.; tibia, 6.8 mm.; tarsus, 6.3 mm.

Female.—Length, 11.5–13.5 mm.; wing, 10.7–10.8 mm. Fore leg, femur, 5.6–5.8 mm.; tibia, 5.1–5.4 mm.; tarsus, 7 mm. Middle leg, femur, 5.4 mm.; tibia, 5.4 mm; tarsus, 6.8 mm. Hind leg, femur, 6.2 mm.; tibia, 6.8 mm.; tarsus, 6.2 mm.

Male.—Rostrum and palpi light brownish-yellow; front and vertex very dark coloured, occiput similar. Antennæ, segment one black, segment two black at base, brown apically, segment three yellowish on basal half, black apically, remainder of antennæ black; antennæ very long, as long as the body; segments one and two short, the third segment very long, segments 4 to 15 long, gradually shortening, terminal segment very short.

Thoracic pronotum deep bluish-black; mesonotum, including the pleuræ similar. Halteres rather pale dull whitish. Fore legs with yellow coxa, dark at base, yellow trochanter, yellow femur broadly tipped with blackish, yellow tibia narrowly tipped with blackish, metatarsus yellowish-brown—darkened into brownish-black at the tip, remaining tarsal segments brownish black; middle and hind legs similar, but their coxæ blackish and the black femoral tips narrower. Wings with cell C yellowish brown, Sc and R more yellowish, remainder of wing hyaline or nearly so, a brown mark at the base of the wing in the neighbourhood of cross-vein h, a cross-band at the cord, often irregular, often a rounded brown spot on vein $Cu_1$ midway between cross-vein m-cu and the tip of the vein, brown marks at end of vein $R_1$, fork of $R_{4+5}$ and fork of M. Venation (see plate III., fig. 7); Rs very short, much shorter than cross-vein r-m, basal deflection of $R_{4+5}$ short but distinct, about one-half as long as Rs, cross-vein m-cu long, curved, longer than the basal deflection of $Cu_1$, placed opposite or very slightly beyond cross-vein r-m.

Abdomen, 1st segment very short, 2nd a little longer than the 4th, 3rd very long, as long as the succeeding 4 segments combined, segments 4 - 8 successively shorter. Abdomen dark brownish black, basal half of segment 4 orange. Hypopygium, 8th tergite narrow, short, widely separated from the somewhat broader 8th sternite, 9th tergite viewed from above very deeply incised, this incision rectangular, the caudad projecting lateral lobes are somewhat swollen basally, narrowed behind, slightly enlarged at the tips, densely clothed with long black hairs, between the lateral arms is a small rounded lobe, directed caudad; the 9th pleurite reaches the 8th tergite, the 9th tergite and 9th sternite being more widely separated; the 9th tergite is triangular,

its apex rounded, bearing a long slender appendage at its tip on the inner side, this appendage long, slender and curved proximad so that each touches its mate of the opposite side, these appendages thickly clothed with long black hairs. The 9th sternite is very high at its base, extending up beyond the ventral level of the 8th tergite, its caudal ventral margin strongly chitinized, produced caudad and dorsad into a long slender arm, just dorsad of which is a shorter, strongly chitinized arm, with five or six blunt teeth on the ventral face. The guards of the penis are separated except at the base, divergent, chitinized, slender, rather blunt at the end, but the outer angle produced distad into a long slender arm. (See pl. IV., fig. 12-16).

*Female.*—Similar to the male, with the following exceptions: Antennæ short; black on tips of femora even more extensive, in fore femur covering almost one-half of the segment; tibiæ almost uniformly brown. Abdomen, tergites 1 to 6 dark brown; segment 7 brown, apical third white; 8th tergite mostly whitish; sternum lighter brown. 9th tergite, blade-like, pointed; 9th sternite short, produced into a short lobe on its dorsocaudal angle; ovipositor chestnut-brown. (See pl. IV.; fig. 11.)

Vial No. 29, Tokyo, Japan; May 7, 1912. 1 ♂, 5 ♀.

Holotype.—Male, Tokyo, Japan; May 7, 1912.

Allotype.—Female, with the type.

Paratypes.—Four females, with the type.

Types in the author's collection.

Paratypes in the U. S. National Museum and Cornell University collections.

*Family Tipulidæ*

*Tribe Limnobini.*

*Genus Dicranomyia* Stephens.

DICRANOMYIA JAPONICA, sp. n.

Subcosta long; wings with a distinct stigma and faint clouds along the cord; femora tipped with brown.

*Male.*—Length, 9–9.4 mm; wing, 9.4–10 mm; antennæ 3.2 mm. Female: Length, 10.2–11.4 mm; wing, 9.3–10.6 mm.

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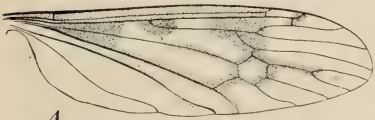

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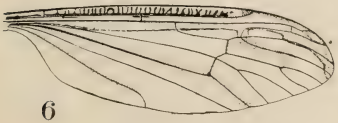

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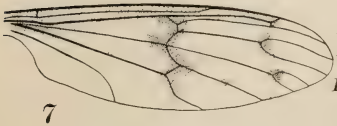


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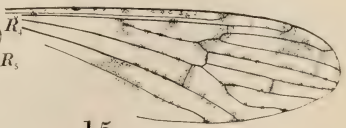

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JAPANESE CRANE-FLIES (ALEXANDER).

*Male.*—Rostrum and palpi brown; antennæ, segments 1 and 2 pale whitish yellow; segment 3 yellowish basally, brown at tip; remainder of antennæ dark brown. Antennæ long; flagellar segments long, cylindrical, subequal in length. Front, vertex and occiput, dark brown; genæ lighter colored, more yellowish.

Pronotum dark brown medially, yellowish on sides; mesonotal præscutum light yellow, with a broad, conspicuous median brown stripe; scutum with the lobes dark brown, paler medially; scutellum dark brown, except the narrow median incision on the anterior margin; post-notum largely dark brown. Pleuræ dull light yellow, the mesopleuræ suffused with brownish. Halteres rather long, pale, knob a little darker. Legs, coxæ and trochanters light yellow, femora dull yellow, the tip brown; tibiæ dull yellow, tip scarcely darker; tarsi, segment 1 dull brownish yellow basally, darkening to brown on apical third; remainder of tarsi brown. Wing pale brownish yellow, costal and subcostal cells rather clearer yellowish; veins brown; a conspicuous brown stigma; very pale grey clouds along the cord, outer end of cell 1st $M_2$, and at origin of Rs. Venation see fig; Sc long, ending before fork of Rs, $Sc_2$ longer than $Sc_1$, at the tip; Rs long arcuated at origin sometimes with a spur. (See pl. III.; fig. 9.)

Abdomen, tergites largely brown, usually with a yellow triangle on the anterior portion of the sides of the sclerites; sternite yellow; 8th and 9th, brown; 8th tergite, with caudal margin pale, straight; 9th tergite, with caudal margin strongly convex; with a brown median mark. Pleural pieces short, triangular, very broad at base, narrowed apically; dorsal apical appendage short, cylindrical, narrowed at tip, its inner or caudal margin provided with 4–5 rounded teeth. Ventral arm a small, rounded, little chitinized lobe, covered with long hairs; guard of the penis very long, pale, projecting beyond the apical appendages, bifid at tip with 2 slightly chitinized divergent horns, these horns directed ventrad; 2nd gonapophyses, slender, much shorter than the penis guard, scarcely enlarged at end, but inner face produced into a short, indistinct tooth. (See pl. IV.; fig. 10.)

Female about as in the male; valves of the ovipositor rather long, the tergal valves much longer than the sternal valves.

Variations: In some specimens the basal 4 or 5 segments are pale; yellow triangles on sides of abdominal tergites vary in distinctness.

Vial No. 4.—Tokyo, Japan; April 25, 1912. 1 ♂.
Vial No. 14.—Tokyo, Japan; April 25, 1912. 1 ♀.
Vial No. 15.—Tokyo, Japan; April 25, 1912. 4 ♂s, 2 ♀s.
Vial No. 24.—Tokyo, Japan; April 27, 1912. 7 ♂s, 6 ♀s.
Vial No. 32.—Tokyo, Japan; May 7, 1912. 3 ♀s.
Vial No. 33.—Tokyo, Japan; May 7, 1912. 2 ♂s.
Vial No. 37.—Tokyo, Japan; May 7, 1912. 1 ♂.
Vial No. 38.—Tokyo, Japan; May 7, 1912. 1 ♀.

Holotype.—♂, Tokyo, Japan; April 27, 1912. (Vial 24).

Allotype.—♀, with the type (Vial 24).

Paratypes.—14 ♂s; 12 ♀s; Tokyo, Japan; April 25–May 7, 1912.

Types in author's collection.

Paratypes in U.S. National Museum and Cornell University collections.

*D. japonica* resembles *umbrata* Meij. from Java (1) but the legs are much paler, wing-pattern and venation different, and it is a much larger species (wing, 9–10 mm.; in *umbrata*, 5 mm.).

*Dicranomyia nebulosa*, sp. n.

Subcosta long; wings clouded with grey; femora pale apically, with a dark subterminal ring.

*Male*.—Length, 5.4 mm.; wing, 5.8 mm.

*Male*.—Rostrum and palpi dark brown; antennæ, 1st segment brown at base, more yellowish at the tip, succeeding segments brown; flagellar segments rounded, short-pedicallate, these pedicels being whitish; front, vertex and occiput, very dark blackish.

Pronotum brownish-yellow, darker brown medially above. Mesonotum rather gibbous, brown, a narrow, darker brown, median line on the præscutum; lateral margin of this sclerite with a rounded dark brown spot which is connected with short lateral stripes nearer to the median vitta; scutum light brown, lobes margined with dark brown; scutellum with a dark brown median mark; postnotum brown. Pleuræ brown, almost uniform, paler near the

(1) (Tijd voor Entomol.; Vol. 44; p. 25; pl. 1, f. 7.; 1911.)

sternum. Halteres pale. Legs, coxæ and trochanters light yellow; femora light brown, becoming light yellow on the apical sixth and with a conspicuous, dark-brown, subapical ring; tibiæ dark brown; tarsi broken. Wings, whitish or subhyaline; costal cell slightly more yellowish; grey clouds as follows: At origin of Rs (largest), at stigma, at tip of Sc, along cord, along outer end of cell 1st $M_2$ and in the center of most of the cells. Venation, (see pl. III.; fig. 10); Sc long, extending far beyond the origin of Rs, $Sc_2$ at the tip of $Sc_1$, Rs almost square at its origin and spurred (in the types), cell $R_2$ almost as far proximad as cell 1st $M_2$ (as in *F. stulta* O.S.), cell 1st $M_2$ long, longer than the veins issuing from it, basal deflection of $Cu_{1a}$ at the fork of M.

Abdomen, tergum dark brown; caudal margins of the 7th, 8th and 9th segments more yellowish; sternum dull yellow. Hypopygium (see figs. 8, 9; pl. IV.); 9th tergite short, its cephalic and caudal margin convex, its caudal half provided with a number of long hairs. Pleuræ very long, cylindrical, the tips produced into a slender lobe on the ventral side; two apical appendages, which are very short and inconspicuous, being scarcely one-third as long as the plura; dorsal appendage simple, short, slender and subchitinized, not exceeding the ventral appendage; ventral appendage double, its dorsal arm being small, triangular and with the caudal or outer face bearing a chitinized tooth, its tip produced entad and cephalad into a blunt lobe; the ventral arm is produced entad into a small lobe, with the tip evenly rounded. Viewed from the side, the pleura is broad, its ventral margin rounded at the base, at the middle of its length produced into a spatulate fleshy lobe which is directed caudad. The guard of the penis is long (extending about to the extreme tip of the pleura), and slender, broad at the base, narrowed toward the tip, the end little, if any, enlarged; the apex is very slightly notched; viewed from the side, it is seen that the extreme tip is bent ventrad; viewed from above, the guard seems to be concave, its lateral margins being more strongly chitinized. The second gonapophyses are rather long, dark brown, subrounded or scarcely pointed at the apex; at their base they are about as broad as the base of the penis guard; the lateral margin of the apophyse is produced dorsad into an incurved, chitinized flap or

margin, which, on the sides, protects the short, slightly emarginate anal tube.

Vial No. H.—Tokyo, Japan; Aug. 1912. 1 ♂.

Holotype, ♂.—Tokyo, Japan; Aug. 1912.

Type in the author's collection.

D. *nebulosa* resembles *unibrata* Meij. (Java), but the leg-pattern and venation are quite different.

*Genus Geranomyia* Haliday.

*Geranomyia avocetta*, sp. n.

Wings spotted; thoracic dorsum brown, the humeral portions of the præscutum yellow; tibial apices not blackened.

*Male*.—Length, excluding the proboscis, 7.5–7.7 mm.; proboscis, 3–3.6 mm.; wing, 7.8–7.9 mm.

*Male*.—Proboscis and palpi dark brown, the former more yellowish basally; antennæ, basal segments dark brown, flagellar segments somewhat lighter brown, segments rounded-oval; front, vertex and occiput dark-colored, almost black.

Pronotum dark brown; in the paratypical specimen, the caudal margin of the scutum and the scutellum, yellowish. Mesonotal præscutum with a broad, dark brown, median line, widened behind; humeral angles conspicuously light yellow, behind darkening into brown of a lighter shade than the broad median vitta; scutum with the lobes dark brown, median line paler; scutellum and postnotum brown. Pleuræ dull brownish-yellow, clearer below. Halteres pale, knob a little browner. Legs: Coxæ and trochanters light yellow, the latter margined with black at the tip; femora and tibiæ light brown, scarcely darkened at their tips; terminal tarsal segments darker brown. Wings, hyaline or nearly so, the costal cells and veins more tawny; veins light brown, darker brown where traversed by dark markings; seven brown marks along the costal margin, the third at the origin of Rs extending down almost to vein M; the fourth at the tip of Sc extending down into cell 1st $R_1$; the 5th (stigmal) spot, largest, rectangular; the sixth and seventh spots at ends of veins $R_{2+3}$ and $R_{4+5}$; cord and outer end of cell 1st $M_2$ seamed with brown; a brown spot at ends of most of the veins, most distinct and largest at the 2nd anal vein. Venation (see pl. III.; fig. 8): Sc long, ending nearer to the fork of Rs than to

its origin; $Sc_2$ at tip of $Sc_1$; Rs long, nearly three times as long as the basal deflection of $R_{4+5}$; basal deflection of $Cu_1$ at fork of M.

Abdominal tergum brown, anterior margins of the basal segments somewhat more yellowish; sternum pale whitish-yellow. Hypopygium (see figs. 5-7; pl. IV.): 8th tergite short, consisting only of a narrow ring, almost straight on its cephalic margin, concave on the caudal margin; 9th tergite convex anteriorly, concave on caudal margin. Pleural pieces very short, cylindrical, not more than twice as long as wide, bearing two apical appendages. The dorsal appendage is a short, slender, strongly curved hook, sharp pointed and more chitinized at its tip; it is directed entad, cephalad and dorsad. The ventral lobes are long, fleshy, between two and three times as long as the pleura and much thicker; at their base, on the inner side, is a short, fleshy tooth, more chitinized at its tip, directed cephalad and dorsad and meeting its mate of the opposite side on the median line; near the tip, on the outer or caudal face, are two, long, slender, subequal bristles, directed caudad. The ventral side of the pleura is produced into a lobe, enlarged apically and directed entad and slightly caudad. The guard of the penis is short, extending slightly beyond the most caudad-projecting portion of the pleura; it is swollen at the base, less so in the middle of its length, its tip small, chitinized, bifid at apex, the tip directed slightly ventrad. The second gonapophyses are very short, and, viewed from above, barely project beyond the fleshy lobe lieing between them.

Vial No. 8.—Tokyo, Japan; April 25, 1912. 1♂.

Vial No. 49.—Tokyo, Japan; August, 1912. 1 ♂.

Holotype, ♂.—Vial No. 8.

Paratype, ♂.—Vial No. 49.

Types in the author's collection.

*G. avoccita*, compared with the four Javan species described by de Meijere, agrees most closely with *G. montana*, which, however, has the wing-pattern much less distinct. From the North American *G. rostrata* Say, it differs conspicuously in its unicolorous tibiæ.

*Genus Rhipidia* Meigen.

*Rhipidia pulchra septentrionis*, subsp. n.

This subspecies differs from typical *pulchra* Meij.* (Java) in

*Neue und bekannte sudasiatische Dipteren; p. 92, fig. 7. Bijdragen tot de Dierkunde, vol. 17, 1904.

antennal coloration, the flagellar segments being alternately dark and light-coloured; segments, 4, 6, 8, 10 and 12 are whitish, the remainder of the antennæ brown. The wings have a large spot at the base of Cu and the venation is not as figured by de Meijere. (Compare fig. 1; pl. III.)

*Female.*—Length, 7.6–8.6 mm.; wing, 7.4 mm.

Vial No. 10.—Tokyo, Japan; April 25, 1912. 2 ♀s.

Holotype and Paratype in author's collection.

In Tijd Voor Entomol., Vol. 44, p. 27, figs. 14–16, de Meijere refers this to *Dicranomyia*. However, I believe his original reference of the species to be the correct one—this belief based on venational hypopygial characters.

*Tribe Antochini*

*Genus Rhamphidia* Meigen.

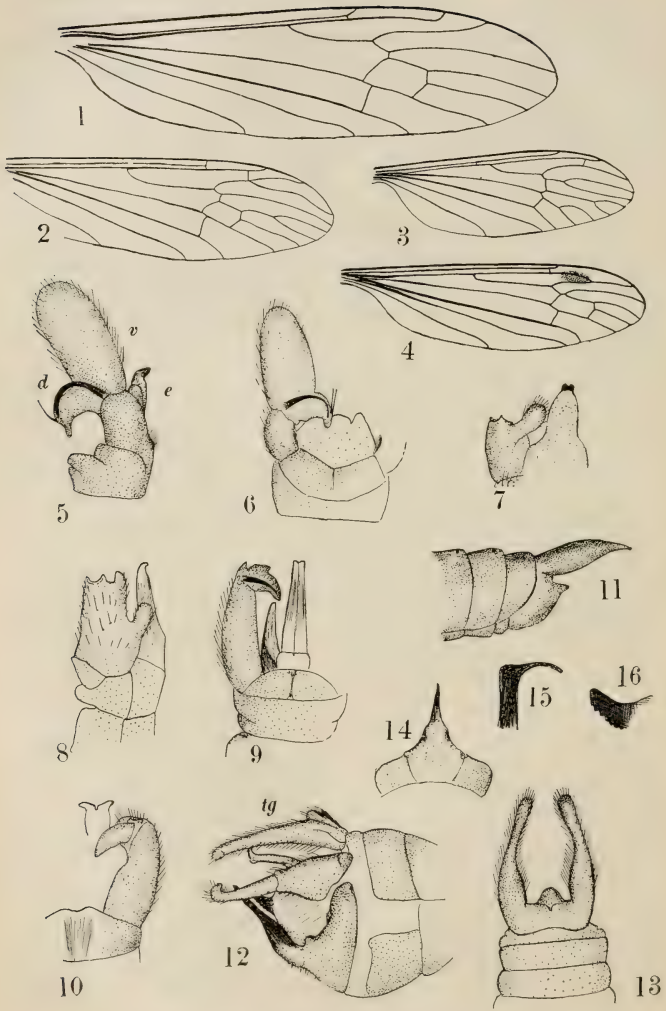
*Rhamphidia nipponensis*, sp. n.

Rostrum short; palpi pale; wings hyaline without darker marks.

Female.—Length, 8.9 mm.; wing, 7.8 mm.; middle leg, femur, 6.6 mm.; tibia, 7 mm.; tarsus, 6.7 mm.

Female.—Rostrum light brown; labrum light yellow; palpi light brownish-yellow; antennæ brown, flagellar segments cylindrical with short black bristles not exceeding the segment in length, the outer segments not conspicuously narrowed; front, vertex, occiput and genæ dark brown.

Pronotum dark brown, mesonotal præscutum light brown, with three broad, darker brown stripes, the median one longest, broadest, very dark brown in front; the lateral stripes begin behind the pseudosutural fovea and cross the suture, suffusing the lobes of the scutum; scutum medially light brown, on margins yellowish-brown; scutellum brown, margined with yellowish; postnotum brown. Pleuræ brownish-yellow, suffused with brown on portions of the mesopleuræ; mesosternum brown. Halteres light yellow, knob slightly darker, brown. Legs: coxæ light yellow, tipped with pale brown; trochanters yellow; femora yellowish-brown, rather clearer yellowish basally; tibiæ brown, tarsi brown, terminal segments rather darker. Wings, hyaline or nearly so; veins brownish




JAPANESE CRANE-FLIES (ALEXANDER).

yellow, stigma not indicated. Venation (see fig. 1; plate IV.); cross-vein r-m distinct; basal deflection of $Cu_7$ beyond the fork of M.

Abdomen, tergum and sternum dark brown; ovipositor light yellow.

Vial No. 28.—Tokyo, Japan; April 26, 1912. 1 ♀.

Holotype, ♀.—Vial No. 28, in author's collection.

This species differs from the European *R. longirostris* by its shorter rostrum, cylindrical flagellar segments with short bristles; pale maxillary palpi and other colorational differences, which may, of course, vary in series.

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## EXPLANATION OF THE PLATES.

### Plate III.

Fig. 1. Wing of *Rhipidia pulchra septentrionis*, sub sp. n.
Fig. 2. Wing of *Limnophila japonica*, sp. n..
Fig. 3. Wing of *Eriöptera elegantula*, sp. n.
Fig. 4. Wing of *Limnophila satsuma* Westwood.
Fig. 5. Wing of *Tricyphona vetusta*, sp. n.
Fig. 6. Wing of T. *kuwanai*, sp. n.
Fig. 7. Wing of *Ptychoptera japonica*, sp. n.
Fig. 8. Wing of *Geranomyia avocetta*, sp. n.
Fig. 9. Wing of *Dicranomyia japonica*, sp. n.
Fig. 10. Wing of D. *nebulosa*, sp. n.
Fig. 11. Wing of *Molophilus pegasus*, sp. n.
Fig. 12. Wing of *Gonomyia insulensis*, sp. n.
Fig. 13. Wing of *Conosia irrorata* Wiedemann.
Fig. 14. Wing of *Gonomyia superba*, sp. n.
Fig. 15. Wing of *Erioptera asymmetrica*, sp. n.

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### Plate IV.

Fig. 1. Wing of *Rhamphidia nipponensis*, sp. n.
Fig. 2. Wing of *Limnophila inconcussa*, sp. n.
Fig. 3. Wing of *Tricyphona insulana*, sp. n.
Fig. 4. *Liogma kuwanai*, sp. n.
Fig. 5. Hypopygium of *Geranomyia avocetta;* lateral aspect. e—penis guard; d—dorsal apical appendage; v—ventral apical appendage.

Fig. 6. Hypopygium of *Geranomyia avocetta;* dorsal aspect.

Fig. 7. Hypopygium of *Geranomyia avocetta;* ventral aspect, showing a portion of the *hypopygium.*

Fig. 8. Hypopygium of *Dicranomyia nebulosa;* lateral aspect. The apical appendages are not included.

Fig. 9. Hypopygium of *Dicranomyia nebulosa;* dorsal aspect.

Fig. 10. Hypopygium of *Dicranomyia japonica;* dorsal aspect.

Fig. 11. Ovipositor of *Ptychoptera japonica;* lateral aspect.

Fig. 12. Hypopygium of *Ptychoptera japonica;* lateral aspect. tg—9th tergite.

Fig. 13. Hypopygium of *Ptychoptera japonica;* 9th tergite, dorsal aspect.

Fig. 14. Hypopygium of *Ptychoptera japonica;* 9th sternite, ventral aspect.

Fig. 15. Hypopygium of *Ptychoptera japonica;* guard of the penis (?).

Fig. 16. Hypopygium of *Ptychoptera japonica;* ventral appendage.

(TO BE CONTINUED.)

## *DONACIA EMARGINATA* KIRBY (COLEOPTERA.) A BIOGRAPHIC NOTE.

BY L. B. WOODRUFF, NEW YORK CITY.

*Donacia emarginata* Kirby may gain its sustenance from various water-loving plants, but that which it seems to find superlatively to its taste near New York City is the Marsh-marigold, *Caltha palustris.* In a certain wooded swamp just outside the city limits, always wet under foot and in April excessively "soft," grow and bloom great masses of these glorious golden flowers; and when they reach the zenith of their splendor, in almost every clump, half buried under their stamens, are from one to several of these graceful metallic beetles. The sturdy crowfoot cup gives them secure support, and in them throughout the flowering period they are to be found in breeding pairs. On the stems just above the roots the pupal cocoons are attached, sometimes several in a row; but when the swollen buds expand the beetles emerge, leave their lowly dwellings, and, climbing up the stems, attain the scene of

their ensuing revels. When not too much engrossed, they display the instinct shared with so many other strongly flying members of their order, and, on the approach of danger, clamber to the petal's edge and seek safety by dropping to the cover that lies below.

The Caltha seems to be an unrecorded food-plant for the genus, though hardly a surprising one in view of its evident adaptability and its environmental association with the skunk cabbage, the resort of certain others of its component species.

So far as they have come under the writer's observation, the males of *D. emarginata* in this neighborhood are uniformly purplish or bluish-black, while the females are never like them in colour, but vary through shining olivaceous green, the shade most commonly occurring, to brassy and rich bronze. If these colour distinctions hold constant with the beetles from other localities, we have here secondary sexual characters which are worthy of note.

## A NEW BRACONID OF THE GENUS MICRODUS FROM CANADA.

BY C. H. RICHARDSON, JR., FOREST HILLS, MASS.

Among a number of parasitic hymenoptera reared from the Bud Moth (Tmetocera ocellana Schiff.), at the Dominion Entomological Laboratory, Bridgetown, Nova Scotia, by Mr. G. E. Sanders, there is a Braconid belonging to the genus Microdus which appears to be new. Since it is desired to refer to this species in the near future, Dr. Hewitt, Dominion Entomologist has asked me to describe it at the present time.

*Microdus ocellanæ*, sp. nov.

Description of the type (female): Length 5 mm. Wing 4 mm. Ovipositor about 5 mm. Head, thorax and abdomen black, refulgent; palpi pale fulvous; fore and middle legs pale fulvous, with the apical joints black; hind legs pale fulvous except for the black coxæ, the black apical annuli on the tibiæ, the darkened distal ends of the first tarsal joints and the complete darkening of the succeeding joints. A large fulvous spot covering the first and second abdominal segments ventrally. Pubescence light. Wings slightly infuscated, iridescent; stigma black. Head slightly wider than thorax, less than three times as wide as thick; clypeus slightly produced; clypeal foveæ large, each equaling an ocellus in size; face

punctuiate, pubescent; vertex, occiput and genæ sparsely punctulate and pubescent. Antennæ 42-jointed, stape and pedicel longer than the first joint of the flagellum; joints of flagellum subequal. Mesonotum punctulate, with deep punctate parapsidal grooves which meet posteriorly. Scutellum punctulate flatly convex; anterior depression of scutellum with four deep umbilicate punctures. Metanotum rugose-punctate; metathoracic spiracles oval, slightly longer than wide. Mesopleuræ sparsely punctulate and pubescent with a curved punctured line just below the tegulæ; a single postmedian fovea and a longitudinal row of umbilicate punctures below this. Metapleuræ more densely punctulate and pubescent. First segment of the abdomen deeply striated longitudinally; the second segment weakly and irregularly aciculated with a median transverse depression; remaining segments smooth, shining.

Type ♀ No. 4001d, July 28, 1912; in Coll. Div. Ent., Ottawa.

Type locality.—*Kentville, Nova Scotia, Canada.*

Paratype (♀) agrees essentially with the type.

This species is related to *Microdus eurinoides* Cresson resembling it in size and colour, but differing in the sculpture of the abdomen, the possession of black hind coxæ and the extent of the black on the hind tibiæ as well as the quite distinctly infuscated wings. It is also very similar to *Microdus nigricoxis* Provancher, but only the hind coxæ are black and the basal segment of the abdomen is striated, not rugose. Acknowledgments are due Mr. C. T. Brues for aid in looking up the literature.

## A SUCCESSFUL MOVE

Recently I had occasion to move my entire collection of over 200 well-filled boxes of Hemiptera from Buffalo, N. Y., to San Diego, Calif., and on unpacking them here was surprised to find that not a single specimen had been damaged. The boxes were packed in straw in two large willow pottery crates and were shipped by freight through one of the household shipping agencies. However, they had to go through two storage warehouses and be twice reshipped before starting on their long ride which speaks well for the packing. I received my instructions for packing from Dr. E. D. Ball and will gladly pass it on to any one contemplating a similar move.—E. P. Van Duzee, 4020 Ivy St., San Diego, Calif.

# DESCRIPTION OF TWO NEW SPECIES OF OCHTERUS LATR. (HEMIPTERA) WITH AN ARRANGEMENT OF THE NORTH AMERICAN SPECIES.

BY H. G. BARBER, ROSELLE PARK, N.J.

The genus Ochterus Latr. (Pelogonus Latr.) is represented in North America by five species—four from Mexico, Central America or the Antilles, and only one has been described from the United States—*O. americanus* Uhl. (Bull. U.S. Geol. and Geogr. Surv. I, 335, 1876). The Mexican and Central American species are well characterized and figured by Champion, in Biol. Cent. Amer. Hem.-Het. II., 344–346, 1901.

I herewith add two more species to the list—one from the collection of Mr. Nathan Banks, who collected several specimens at Glencarlyn, Va., in June, and the other represented by a single specimen from Mrs. Slosson's collection, taken by her at Ormond, Florida, in the spring. The former of these must be closely related to the Palæarctic *O. marginatus* Latr., the latter is more closely allied to *O. americanus* Uhl.

The following synopsis of the North American species of Ochterus is adapted from Champion's key:

Anterior angles of the pronotum acute; humeri rounded; face not at all or obsoletely carinate between the eyes ..... *perbosci* Guér. (Mex., Antilles.)

Anterior angles of the pronotum obtuse or rounded.

Humeri rounded.

Face not carinate between the eyes ..... *œnifrons* Champ. (Mex., Cent. Am., Antilles)

Face distinctly carinate between the eyes.

Clavus entirely yellow ..... *flaviclavus*, n. sp. (Florida).

Clavus concolorous.

Entire lateral pronotal margins broadly pale ..... *banksi*, n. sp. (Virginia)

Lateral pronotal margins, with only a pale spot anteriorly ..... *americanus* Uhl. (U.S.)

Humeri subacute. Face carinate and closely rugulose between the eyes.....,*viridifrons* Champ. (Cent.Amer.)

Humeri acute. Face carinate, but almost smooth between the eyes.....*acutangulus* Champ. (Cent. Amer.)

*Ochterus banksi*, n. sp.

Broad ovate, brownish black. The head, behind the vertex, opaque, from there anteriorly, shining and obilquely, finely regulose and tricarinate; one carina next each eye and a median one, continuous from vertex to apex; transversely sulcate midway between ocelli and base of head. Pronotum with anterior margin almost truncated, with the anterior angles next the eyes rounded and not projecting forwards or outwardly beyond the exterior margin of the eyes; entire lateral margins gently rounding posteriorly; humeral angle rounded, not very prominent; lateral margins broadly expanded, pale; this mark broadest about the middle, more abruptly rounded anteriorly and tapering posteriorly to occupy the entire margin; the remainder of the surface brownish black, elevated and transversely, but not very deeply, sulcate a very little behind the middle; posterior lobe, middle and anterior part of first lobe more coarsely punctate, the latter with two or three transverse weak furrows. Scutellum almost equilateral, rather coarsely punctate and transversely furrowed; anteriorly with a transverse elevated ridge, behind which it is depressed. Corium not demarked from membrane, broadest across the middle, with lateral margin gently rounded to just beyond middle, where it more abruptly rounds off to the rather narrow apical part of membrane; the external margins either broadly pale throughout or in part suffused with fuscous and reflexed, without the usual series of pale marginal spots

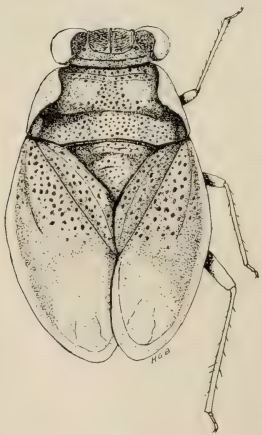

FIG. 9.
*Ochterus banksi*, n. sp.

which occur in *O. americanus*. Clavus and corium, anteriorly, with coarse scattered punctures. Nervures of the membrane indistinct. General surface with indications of the customary bluish grey markings, unless denuded, when the whole upper surface is smooth and shining. Beneath on sternum and venter paler, with rostrum, acetabulæ, coxæ, legs and external angle of metathorax pale yellow. Prosternum rather coarsely punctate.

Length, 4 mm. Width of pronotum, 2 mm.

Described from three males and one female collected by Mr. Nathan Banks at Glencarlyn, Virginia, in June. Judging from the meagre descriptions and indifferent illustrations at hand, I am led to the opinion that this species is most nearly related to *O. marginatus* Latr., of Europe. But having no specimens of that species for comparison, I am, at this time, unable to settle the point. *O. banksi* can readily be separated from *americanus* by its difference in color markings, and the character of the pronotum. Apex of membrane is more narrow than in *americanum*.

*Ochterus flaviclavus*, n. sp.

Brownish-black. Very much the appearance of *O. americanus*, to which it is closely related, having the usual carinate and rugulose face. However, somewhat smaller than that species with the clavus entirely yellow. The pronotum with the lateral margins gently rounded, more converging anteriorly, the anterior margin being narrower than the width across the eyes; the anterior angle of the pronotum sharply rounded and not projecting anteriorly as in *americanus:* the expanded part of lateral margins narrower, with a small yellowish spot just posterior to the anterior angle; the humeral angle almost rectangular, projecting but a trifle beyond margin of corium. Extreme edge of corium very narrowly pale, but the usual pale marginal spots are lacking. Surface with the usual pearl grey spots. Beneath, with the sternum slate grey; the acetabula, posterior and lateral flange of the prosternum, elytral flange anteriorly, posterior margin of metasternum, legs and venter, pale; legs lightly infuscated. Prosternum, mesosternum externally and metasternum before the posterior angle distinctly punctate.

Length, 3½ mm.; width of pronotum, about 2 mm.

Described from a single male in the collection of Mrs. Annie Trumbull Slosson, taken by her at Ormond, Florida.

## A SECOND ADDITION TO THE AUSTRALIAN HYMENOPTERA MYMARIDÆ.

BY A. A. GIRAULT, BRISBANE, AUSTRALIA.

The following species have recently been captured by Mr. Alan P. Dodd and very kindly given to me. They are the eighteenth and nineteenth species of *Gonatocerus* and the sixth, seventh and eighth of *Polynema*. All in normal position.

1. *Gonatocerus bicolor*, new species.

*Female.*—Length 1.65 mm. Large for the genus.

Black, the abdomen contrasting orange reddish, dorsad with faint duskiness, the scape and pedicel lemon yellow, as are also the legs and coxæ; tibiæ fuscous. Ovipositor not exserted. Fore wings of the narrower type, yet moderately broad, bearing about thirty longitudinal lines of very fine discal cilia, lightly fumated throughout, the marginal cilia short, the longest not more than a fifth of the greatest wing width. Proximal tarsal joints very long. First funicle joint longer than either the pedicel or the second joint of the funicle, subequal to funicle joint 3, joints 4 and 5 each somewhat shorter than 3, joint 5 shorter than 4, 6 still shorter than 5, while 7 lengthens slightly, subequal to 2; distal funicle joint shortest, subequal in length to the pedicel. Of the general habitus and structure of *spinozai* Girault and belonging to the group of species with graceful fore wings and usually golden bodies (*e.g.*, *comptei*, *cingulatus*). Marginal vein very long. Caudal wings with an incomplete, more or less variable, paired line of midlongitudinal discal ciliation. Club long.

(From one specimen, 2-3-inch objective, 1-inch optic, Bausch and Lomb).

*Male.*—Not known.

Described from a single female captured by sweeping jungle growths along forest streamlet, near Nelson, North Queensland, December 6, 1912 (A. P. Dodd).

*Habitat:* Australia—Nelson (Cairns), Queensland.

*Type*: No. *Hy 1293*, Queensland Museum, Brisbane; the above specimen on a slide of xylol-balsam.

This beautifully coloured species may be distinguished with ease by the great contrast between the black of the thorax and the

orange of the abdomen, by the clouded wings and long venation and by the long first joint of the antennal funicle. It is allied to *spinozai*, but could not be confused with that characteristic species.

2. *Gonatocerus spinozai* Girault.

At the same time that the above new species was captured Mr. Dodd obtained a pair of this species. The male was unknown and, since it differs considerably in coloration from the female, I briefly point out its characteristics. In structure, similar to the female, but the antennæ are 13-jointed and filiform, the pedicel very small and sublobate, funicle joints 2-4 and 9-10 subequal, longest, about thrice longer than wide; joints 1 and 5 subequal; somewhat shorter than the others; joints 13, 6 and 7 subequal, still somewhat shorter; joint 8 shortest, a third shorter than joint 2. Abdomen subpetiolate, declivous from above at base, ovate, striped dorsad with black, transversely (6 stripes counting the broadest at extreme base). Propodeum purplish black, its spiracle very minute, round, the surface finely reticulated, a median carina present (its exact shape not seen, probably paired). Tip of dorsal abdomen black. Otherwise coloured as in female. When mounted in balsam, the tip or apex of the declivous part of the base of the abdomen closed up to the thorax, partially concealing the real nature of the segmentation; this apex is projected or heeled, stopper-shaped and appearing as if it was intended to fit against the thorax.

3. *Gonatocerus fasciativentris*, new species.

*Male.*—Length 1.15.mm.

Black, the abdomen golden yellow, conspicuously striped transversely with black above and below, the intervening yellow stripes much narrower, the lateral line yellow (about six black stripes). Legs yellowish brown, the coxæ black. Wings hyaline, the fore wings of the less graceful type, the marginal vein moderately long; fore wing with about twenty-five lines of discal cilia; posterior wings narrow. Scape, pedicel and first funicle joint more or less suffused with yellowish. Antennæ strongly longitudinally striated, the funicle joints short and subequal, each about one and a half times longer than broad. Allied with *coethei*, but, besides the differences in coloration, the fore wings are broader. Pedicel only half the length of the first funicle joint.

(From one specimen, similarly magnified).

*Female.*—Not known.

Described from a single male captured with the preceding two species.

*Habitat:* Australia—Nelson (Cairns), N. Q.

*Type:Hy 1294*, Queensland Museum, Brisbane, the above specimen (mounted with the types of *G. brunoi lyelli* and *Polynema devriesi* both described beyond).

4. *Gonatocerus brunoi lyelli*, new variety.

*Male:* Like the typical forms, but the abdomen at its distal half dorsad distinctly banded by narrow golden yellowish stripes (two or three), the wings very dark.

(From one specimen, enlarged as with preceding species).

Respectfully dedicated to the late Sir Charles Lyell, the author of the "Principles of Geology."

Described from a male captured with the preceding species.

*Habitat*: Australia—Nelson (Cairns), Queensland.

*Type*: No. *Hy 1295*, Queensland Museum, Brisbane, the above specimen (mounted with the type of *Gonotocerus fasciativentris* Girault and a *Polynema*).

Genus *Polynema* Haliday.

1. *Polynema devriesi*, new species.

*Male*: Length, 1.2 mm.

Somewhat similar to both *draperi* and *romanesi* Girault, but differing from the former in having the discal cilia of the fore wing much coarser, from the latter in the same point, from both in general coloration being ferruginous, the distal third of the abdomen black. Scape and pedicel concolorous, the flagellum black, its joints very long, as are also the proximal tarsal joints. About nine lines of rather coarse discal cilia, the marginal cilia longer than the wing's greatest width. Distal tarsal joints black. Wings obscurely fumated, the posterior ones very narrow, the fore wings narrowing proximad before venation.

(From one specimen, similarly magnified).

*Female:* Not known.

Described from a single male captured with the species of *Gonatocerus* noted above. Respectfully dedicated to Hugo De Vries, the author of the mutation theory in biology.

*Habitat:* Australia—Nelson (Cairns), N. Q.

*Type:* No. *Hy 1296*, Queensland Museum, Brisbane, the above specimen in balsam (mounted with the types of *Gonatocerus fasciativentris* Girault).

2. *Polynema mendeli*, new species.

*Male:* Length 1.20 mm.

Like *devriesi*, but the discal cilia of the fore wing is finer, the marginal cilia shorter, not quite as long as the greatest width of the blade, subfuscous, not as slender proximad before venation; in this species the proximal funicle joint is much shorter than the next joint, not half its length, while also joints 5 distad of the flagellum are all short, more or less subequal to 1, flagellar joint 2 longest, 3 and 4 next in succession. This antennal structure easily separates this species from *draperi* and *romanesi*. Ferrugineous, the abdomen (exclusive of pedicel) black, as are also the distal tarsal joints and the flagellum; proximal funicle joint yellowish, head blackish. Fore wings with about 10 lines of fine but rather long discal cilia.

(From one specimen, enlarged as in previous descriptions.)

*Female*: Not known.

Described from one male, captured with the preceding species. Dedicated to Abbé Gregor Mendel, who established the Mendelian principle of inheritance.

*Habitat:* Australia—Nelson (Cairns), Queensland.

*Type:* No. *Hy 1297*, Queensland Museum, Brisbane, the above specimen in balsam (mounted with specimens of *Gonatocerus spinozai* and the type of *Polynema nardaui*, described beyond).

3. *Polynema nordaui*, new species.

*Female:* Length 0.60 mm. Small for the genus.

Black, the first three antennal joints, abdominal pedicel, legs except distal half of posterior femur and distal tarsal joints, orange yellow. Like the North American *longipes* Ashmead, being about the same size and habitus, but differing in that the wings of *longipes* are much narrower and slender and the antennal segmentation entirely different, since in this Australian species the second

and third funicle joints are long and subequal. Very much like *draperi* in wing structure, but the legs are brighter and orange. Funicle joint 1 longer than the pedicel, joints 2 and 3 longest, subequal, elongate, one and a half times longer than 1, joint 4 a fourth shorter, 5 shorter, somewhat enlarged, somewhat longer than 1. Scape moderate in length.

(From one specimen, enlarged as in preceding.)

*Male:* Not known.

Described from one female, captured with the preceding species.

*Habitat:* Australia—Nelson (Cairns), Queensland.

*Type:* No. *Hy 1298*, Queensland Museum, Brisbane, the above female in balsam (mounted with *Gonatocerus spinozai* and the type of *Polynema mendeli*).

Respectfully dedicated to Max Nordau.

This species may be the female of *draperi*, which it resembles closely, but there are differences which make me doubt it, especially in the shape of the fore wings, the relative length of the cephalic marginal cilia of those wings and the differences in colour.

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## SOME NEW AUSTRALIAN GENERA IN THE HYMENOPTEROUS FAMILIES EURYTOMIDÆ, PERILAMPIDÆ, EUCHARIDÆ AND CLEONYMIDÆ.

BY A. A. GIRAULT, NELSON (CAIRNS) N. QUEENSLAND.

### Family Eurytomidæ,

### Eurytomini.

*Xanthosomoides*, new genus.

*Female.*—Non-metallic, yellow, body not umbilicately punctate, fore wing with a stigmate spot at the stigmal vein. Head normal, the antenna inserted in the middle of the face, 11-jointed, the club solid, the funicle 7-jointed, cylindrical, its joints not much longer than wide, the single ring-joint rather stout, the pedicel nearly as long as the first funicle joint, the scape rather long, simple. Wings large, the marginal vein long and slender, at least two-thirds the length of the long submarginal vein, thrice or more the length of the rather short stigmal vein, the postmarginal vein also very long, nearly as long as the marginal or quite equal to it

(or slightly longer than it), tapering distad. Wings normally ciliate, the marginal fringes short. Abdomen as long as the thorax, the ovipositor and its valves exserted, curved upward, fully as long as the rest of the body. Abdomen sessile but narrowed at base, triangular from lateral aspect. Propodeum slightly shorter than the scutellum or the prothorax and simple, without carinæ. Parapsidal furrows complete. Eyes ovate, the ocelli in a triangle in the centre of the vertex, the lateral ones distant from the eye margins. Propodeal spiracle elliptical. Face subquadrate, wide.

*Male.*—Not known.

A genus related to *Xanthosoma* Ashmead, from which it differs in bearing the much longer marginal and postmarginal veins and non-moniliform funicle joints.

*Type.*—The following species:

1. *Xanthosomoides maculatipennis*, new species.

*Female.*—Length, variable, 2.50 mm. exclusive of ovipositor, the exserted portion of the latter about the same length.

Pale cadmium yellow, the head, pronotum, legs and a transverse spot laterad of the mesopostscutellum (the spot cephalad of the propodeal spiracle) contrasting yellow, lighter, lemon yellow; also more or less, the produced part of the ventral abdomen. Lateral suture of scutellum, the visible (dorsal, lateral) portions of the occiput and the cephalic margin of the propodeum, black. Dorsal aspect of abdomen suffused irregularly with brown. Venation black. Fore wings hyaline, but with a conspicuous, rather large, black globe-like stigmal spot, regularly oval in shape, obscuring the curved stigmal vein and appearing as if suspended by a short pedicel from the end of the marginal vein. Ciliation normal and dense, the marginal fringes very short. Antennæ yellow suffused with much black. Ovipositor brown, the valves black. Thorax delicately, transversely wrinkled. Club solid, first funicle joint widening distad, nearly twice longer than broad at apex. Scape yellow, black above.

(From three specimens, the same magnification.)

*Male.*—Not known.

Described from three females on cards from the collections of the Queensland Museum, labelled "Bred out of Gall 5 A. Brisbane. H. Hacker."

*Habitat*: Australia—Queensland (Brisbane).

*Type:* No. *Hy 1192*, Queensland Museum, Brisbane, one female on a card.

2. *Xanthosomoides fulvipes*, new species.

*Female.*—Length, 4.2 mm. excluding the ovipositor, the latter exserted for a length nearly equal to that of the body. The same as *maculatipennis*, but much more robust; also the pronotum is nearly as dark as the scutum, its caudal margin contrasting lemon yellow followed by a narrow black stripe running across the cephalic margin of the scutum; the propodeum is wholly black or very dark, the ovipositor fuscous, the meson of the thoracic venter is black and in the venter of the prothorax there is a distinct triangular black marking like the Greek letter Delta of the capital case. The postmarginal vein is slightly longer than in the first species, the apparent petiole of the stigmal spot in the fore wing also longer. Vertex dark ochreous, the face lemon yellow. The wings are large. First funicle joint longer, cylindrical, more than twice longer than broad at apex.

(From a single specimen, the same magnification.)

*Male.*—Not known.

Described from a single female specimen from the collections of the Queensland Museum, labelled "Brisbane, H. Hacker. 3–7–1911."

*Habitat:* Australia—Brisbane, Queensland.

*Type* in the Queensland Museum, Brisbane, the foregoing specimen on a card.

*Melanosomellini*, new tribe.

Antennæ 12-jointed, with one ring-joint, the club 3-jointed, the male antennæ different and bearing long ramii; otherwise as in the Eurytomini and Rileyini as limited by Ashmead. The marginal vein two and a half times its own width, but shorter than either the stigmal or postmarginal veins. Probably differing totally in habits from the Rileyini, since the latter appear to be egg parasites of the Orthoptera. The following genus:

*Melanosomella*, new genus.

*Female.*—Head (cephalic aspect) slightly wider than long, the antennæ inserted slightly below the middle of the face, the scrobes

short and not deep, the lateral ocelli far distant from the eyes; pronotum not long, the parapsidal furrows complete, the head and thorax smooth. Antennæ 12-jointed, the ring-joint large, nearly as long as wide, the funicle apparently compressed, the joints all transverse and lamellate or produced toward one side, the distal joint much less so and largest of the funicle; pedicel subquadrate, much longer than the proximal funicle joints; club long-ovate, longer than the cylindrical, simple scape, its joints obliquely truncate, the distal joint short and conic. Fore wings normal, the marginal cilia sparse and short. Propodeum with a bright median carina, its spiracle large and nearly round. Abdomen short and stout, no longer than the thorax, its second segment occupying half of the surface. Scutellum longer than the propodeum. Parapsidal furrows complete. Posterior tibiæ apparently with but one apical spur.

*Male.*—The same, the abdomen more depressed and cylindrical; antennæ entirely different, the scape much shorter, dilated ventrally, the antennæ 12-jointed, the pedicel not much longer than thick, the ring-joint like a ring, the first funicle joint very transverse and lamellate; following five funicle joints very transverse and increasing in length, each bearing a long, curved, cylindrical ramus from its disto-lateral margin, joint 2 no longer than the diameter of its ramus and practically forming a continuation of it; joint 3 slightly larger than wide; joint 6 much longer than wide; the ramii longer proximad, the shortest and distal one distinctly longer than any single joint of the antenna. Proximal joint of club elongate, obconic, forming half of the club and longer than the distal funicle joint; the other two club joints subequal. Funicle and ramii with sparse, long fine hairs.

*Type.*—The following species (flavipes).

*Female.*—Length, 3 mm.

Black and shining, the face, genæ, legs (except coxæ, the tarsi more brownish), scape (except at tip, where it is blackish) the margin of the eyes dorsad and caudad more or less obscurely, lemon yellow; the black of the vertex at the meson projects obtusely into the yellow of the face, some distance directly cephalo-ventrad of the

cephalic ocellus. Tegula brownish. Fore wing with a distinct brownish band nearly across it from the apex of the submarginal vein; this stripe is interrupted. Venation black. Antennal flagellum brownish, subfuscous. Face with thimble punctures; remainder of body apparently simple and shining more or less.

(From one specimen, the same magnification.)

*Male.*—The same, but the fuscous stripe on the wing subobsolete.

(From one specimen, the same magnification.)

Described from a single pair received for study from the Acting Government Entomologist of Victoria, cardmounted and labelled "From unknown galls on Eucalyptus, N.S.W."

*Habitat.*—Australia—New South Wales.

*Types:* No. *Hy 1193*, Queensland Museum, Brisbane, the above specimens (2 pins) plus a slide bearing male and female antennæ.

Family Perilampidæ.

*Epiperilampus*, new genus.

*Female.*—The same as *Perilampus* Latreille, but the thorax not coarsely punctate but only with scattered thimble-punctures and transversely wrinkled, the antennæ with two large ring-joints and a well-defined, 3-jointed club, the joints of the flagellum distad transverse, the pedicel larger than the first funicle joint. Marginal, stigmal and postmarginal veins shortened but still moderately long, yet the postmarginal is somewhat shorter than the other two, which are subequal; the stigmal vein with a slender neck. Fore wings with a fuscous blotch under the end of the submarginal vein. Antennæ inserted in the middle of the face, the head more or less lenticular from cephalic aspect. With an encyrtine habitus. Scutellum simple. Axillæ separated. Discal ciliation of the fore wing not quite normal. Second segment of abdomen nearly half the latter's length, the third short.

*Male.*—Not known.

A genus resembling *Perilampus*.

*Type:* The following species:

1. *Epiperilampus xanthocephalus*, new species.

*Female.*—Length, 2.5 mm.

Orange yellow, the parapsides cephalo-mesad marked with metallic bluish, the propodeum and abdomen shining blackish or dark metallic bluish, but the latter in the dorsal aspect of the base of its distal half with a conspicuous yellow marking, incised medially from behind (caudad). Legs nearly all dark metallic bluish, but with brownish markings at the knees and tarsi, the cephalic tibiæ nearly all brown. Venation brownish, the marginal, stigmal and postmarginal veins lemon yellow; the fore wings lightly embrowned throughout and with a distinct, smoky brown cloud under the apex of the submarginal vein, extending across the wing, but interrupted caudad of its middle by a clear longitudinal streak; its proximo-cephalic margin is accented and another shorter clear streak enters it from proximad nearer the caudal wing margin. Marginal fringes extremely short, as is also the discal ciliation, which is speckled over the wing surface like minute pin-points, quite irregular but not dense. Scape yellow, dark above and at tip, the remainder of the antenna brownish yellow, sometimes bluish, proximal joint of club subequal to distal funicle joint, both wider than long; funicle joints 2 and 3 subquadrate, subequal. Thorax finely polygonally sculptured, the scutum with obscure punctures.

(From many specimens, the same magnification.)

*Male.*—Not known.

Described from a number of specimens in the Queensland Museum, mounted on cards labelled respectively: "Gall, No. 6 Brisbane. H. Hacker. 19–7–11." 4 ♀'s. Types:"Gall No. 6; 3 ♀'s": "Gall No. 6," three cards 5 ♀'s, 5 ♀'s and 6 ♀'s; and "Gall No. 6. Brisbane. H. Hacker. 19–7–11." 3 ♀'s. Evidently reared from galls.

*Habitat*: Australia—Brisbane, Queensland.

*Types:* No. *Hy 1194*, Queensland Museum, Brisbane, the four females on a single card as above noted, plus a slide of xylol-balsam bearing an antenna and a pair of wings.

Family Eucharidæ.

*Epimetagea*, new genus.

*Female.*—The same as *Metagea* Kirby, but the antennæ not moniliform and only 10-jointed. Also agreeing somewhat with *Pseudochalcura* Ashmead, but differing again in lacking one antennal

joint. Head thin, triangular, the antennæ inserted slightly below the middle of the face, 10-jointed, the club solid and ovate, longer than any of the funicle joints, but slightly shorter than the simple, cylindrical scape; pedicel obconic, short, subequal to joint 4 of the funicle, bearing from one side of its apical margin a single, very long, slender but stiff bristle-like seta, which reaches distad nearly to the apex of joint 3 of the funicle. Proximal funicle joint longest, nearly twice the length of the pedicel, all the funicle joints obconic, widening distinctly distad, all more or less prolonged obtusely from one apical corner, the distal joints more so. None of the joints petiolate or subpetiolate; no ring-joint. Mandibles long and falcate, acute at apex, the right with two large triangular teeth within, the left one which is larger than either of those of the right; also exteriorly at base each with a large tooth. From beneath the clypeus there projects a flat, palmate (9-digitate) brownish plate, above and between the mandibles; clypeus convex along the distal margin, the latter with two teeth on each side of its end, the first very obtuse, the second more tooth-like, but not large. Ocelli nearly in a straight line across the vertex, the cephalic one within and at the apex of the short scrobicular cavity. Parapsidal furrows complete, with deep punctures. Scutellum normal, terminating in a short plate whose distal margin is entire though convex. Thorax elevated convexly in places, but the convexities obtuse. A rather large, tooth-like plate from the lateral aspect of the thorax some distance beneath the axilla. Thorax with large, irregular reticulations or narrow carinate lines, but not punctate excepting the large punctures in sutures. Abdomen with a distinct petiole, which is moderate in length, depressed, diamond-shaped from dorsal aspect, opaque. Proximal tarsal joints of all the legs long and slender. Venation obscure, the stigmal and postmarginal veins short, much shorter than the marginal, the stigmal the longer of the two, curved or bent like a boomerang. Wings hyaline, all ciliation nearly absent; a trace of marginal cilia disto-caudad. From lateral aspect, scutellum appearing as if terminating in a short, acute tooth.

*Male.*—Not known.

*Type:* The following species (*purpurea*).

1. *Epimetagea purpurea*, new species.

*Female.*—Length, 3.5 mm.

Metallic purple, the abdomen with metallic green reflections; knees, tibiæ, tarsi (except distal dark part of distal joint) and the antennæ, brown, the latter suffused with purplish distad. Venation nearly invisible, but the stigmal vein brownish. Head impunctate, but with very fine circular striæ; lateral ocelli very distant from the eye margins; scrobicular cavity with its lateral margins noncarinate; a tubercle at latero-cephalic aspect of pronotum. Scutellum between and behind the axillæ (at the meson) sunken. Abdominal petiole longitudinally striate. Cephalic part of thorax dorsad (cephalad of the middle of the scutum) coarsely reticulate, as is also much of the scutellum. Base of propodeum with deep, transverse foveæ.

(From three specimens, the same magnification.)

*Male.*—Not known.

Described from three female specimens kindly given to me by Mr. F. P. Dodd, mounted together on a card labelled "From ant pupæ. Townsville, July 1902."

*Habitat:* Australia—Townsville, Queensland.

*Types:* No. *Hy 1195*, Queensland Museum, the above specimens (two more or less mutilated) on a single card, plus a slide of xylol-balsam bearing female head and antennæ.

Family Cleonymidæ.

Chalcedectinæ.

*Calosetroides*, new genus.

*Female.*—Allied to *Amotura* Cameron, but the front femora are swollen, compressed and excised beneath at apex, the posterior femora unarmed beneath. Legs unarmed otherwise; cephalic tibiæ somewhat compressed; caudal coxa compressed, flat interiorly, the caudal femur enlarged but unarmed; caudal tibiæ with two unequal spurs, both rather large. Tarsi five-jointed. Antennæ inserted distinctly below the ventral ends of the eyes; very near the clypeus, the scape obclavate and long, the flagellum 9-jointed, no ring-joint. Scrobicular cavity long, but not including the cephalic ocellus, the lateral ocelli separated from the eye margin, the three

in a small triangle in the center of the vertex; eyes somewhat convergent above, long-ovate, naked. Bulbs separated by a long, acutely triangular raised area in the scrobicular cavity. Genæ long, genal suture distinct. Pronotum incised at meson. Parapsidal furrows complete, the axillæ rather widely separated. Scutellum simple, its caudal margin carinate and preceded by a line of deep punctures separated by narrow, short carinæ. Propodeum with a short, solid acutely margined median carina, which is V-shaped and margined on each side by a broad sulcus; the spiracle cephalad, large, elliptical. Abdomen sessile, the ovipositor not exserted, the abdomen not any longer than the head and thorax combined, flat above, acutely conic-ovate, its second segment smooth, forming nearly half of the surface. Wings infuscated; marginal vein long, only slightly shorter than the submarginal, the stigmal and postmarginal veins also long, the former curved, only half the length of the postmarginal, which is three-fourths the length of the marginal. Metallic, large.

*Male.*—Not known.

Type: The species *australica*, described forthwith.

1. *Caloseteroides australica*, new species.

*Female.*—Length, 5.65 mm.

Metallic purplish with aeneous tinges, the face metallic green; legs reddish brown, the coxæ, the posterior femora (exteriorly only) concolorous, the intermediate tibiæ promixad and exteriorly and the cephalic tibiæ exteriorly or along the outer margin, black. Wings with a distinct, large embrowned subsagittate cloud in its middle, longitudinally, the area appearing as if hung by one of the lateral angles from the apex of the stigmal vein; also there is an elliptical spot suspended from the apex of the submarginal vein. Antennæ black, the scape concolorous. Head and thorax granulately punctate.

*Male.*—Not known.

Described from a pinned female received from the Acting Government Entomologist of Victoria, labelled "Millbrook, Victoria."

*Habitat:* Australia—Victoria (Millbrook).

*Type:* No. *Hy 1196*, Queensland Museum, Brisbane, the above specimen, plus a slide, bearing fore wing, the legs and antenna.

## SOME FOSSIL INSECTS FROM FLORISSANT, COLORADO.

BY T. D. A. COCKERELL, UNIVERSITY OF COLORADO, BOULDER, COL.

The insects now described have a very modern aspect. The anal cell of *Venallites*, taken by itself, may be thought of as primitive, but the fly is otherwise a specialized type. Certainly there has been little advance in insect evolution since the Miocene, but many genera have become extinct.

### HOMOPTERA

*Echinaphis* new genus (Aphididæ)

Stout, with long antennæ; the two basal joints short as usual; the first somewhat gibbous at apex on inner side; front broad; abdomen with six longitudinal rows (the outer was lateral) of about six very strong black spines; the apex of abdomen, which is broad, with a transverse (marginal) row of six still larger and stronger spines; cornicles not evident, probably small; hind wing of rather coriaceous texture, the venation essentially as in *Chaitophorus*. Anterior wings not preserved in type.

*Echinaphis rohweri*, n. sp.

Length, 3 mm.; width of abdomen, 1.75 mm.; length of hind wing a little over 2 mm.; dark colored, with the anterior legs clear ferruginous; wings reddish; front and sides of thorax without hairs. The following measurements are in microns: Width of front between eyes 320; length of first antennal joint 128; of second 80; antenna, from base of third joint to apex, 1665; length of a dorsal spine about 160; of a caudal one about 270; distance between the wing-veins (Cu and M.) at base (separation from Rs) about 112. The veins are nearer together at base, and less parallel than in *Chaitophorus populicola*.

FIG. 9
*Echinaphis rohweri*. Ckll.

Miocene shales of Florissant, Station 13 (*S. A. Rohwer*).

This singular species is quite unlike any of the fossil Aphids previously described from Florissant. In the development of spines, it has a certain resemblance to the living *Chaitophorus spinosus* Oestl., found on oak in Minnesota. *Sipha glyceriæ* (Koch), which is also spiny, has much shorter antennæ. Close to

the type of *Echinaphis rohweri* is an elongated, minutely reticulated object 690 microns long, shaped like the egg of *Aedes grossbecki*, but broader, with the reticulations considerably more minute and rather transverse than longitudinal, in the manner of *Aedes colopus*. It is, I think, a mosquito egg, and is the first fossil from Florissant I have been able to refer to the Culicidæ.

DIPTERA.

*Asilus peritulus* Cockerell.

Two wings from Station 14 (Geo. N. Rohwer).

*Verrallites*, new genus (Bombyliidæ).

A genus of slender-bodied Bombyliidæ, with clavate but not much elongated abdomen, characterized especially by the anal cell being very widely open, its width on margin in the typical species 720 microns, which is a slight fraction more than the width of the third position cell on the margin. Head and thorax apparently bare; abdomen sparsely minutely hairy; costa minutely bristly; auxiliary vein longitudinal, reaching costa near (apparently a little before) middle of wing (practically as in *Lordotus*); marginal cell long and narrow, its lower side gently concave, its apex broadly rounded, the second vein turned basad before reaching the costa (the cell practically as in *Lomatia lateralis*, except that the outer angle with costa is more acute in the fossil); two submarginal cells the second elongate, widened apically (about as in *Phthiria pulicaria* except that the upper nervure curves upwards apically, more as in *Geron*); four posterior cells, the first nearly parallel-sided throughout (in the manner of *Phthiria*), the others widely open, the third very broadly open (much as in *Ploas virescens*, only much longer); fourth posterior narrowed basally and extremely widely open apically (*Phthiria*-style, only more elongated); anterior cross-vein far beyond middle of discal cell, beyond the beginning of its last third.

*Verrallites cladurus*, n. sp.

Length about 7 mm., with the abdomen gently curved; abdomen with a depth of 2 mm. near apex; wings 5.75 mm. long. Head and thorax probably black in life; abdomen apparently brown, the sutures broadly colourless; wings clear hyaline.

Miocene shales of Florissant, Colorado, Station 13 B (Univ. of Colorado Exped.)

This remarkable genus is dedicated to G. H. Verrall, whose writings are invaluable to students of fossil Diptera, although he studied only living forms. In Williston's table (N. Am. Diptera, 3rd. Edit.) it runs to 29, and the wings, except for the anal cell, show a rather close general resemblance to those of *Lepidophora*. In *Legnotomyia* the anal cell is as widely open on the wing margin as the third posterior, but these cells are not nearly as wide as in *Verrallites*; the discal cell in *Legnotomyia* is also much shorter than in the fossil, and there are other important differences. From all the genera of fossil Bomlyliidæ from Florissant, *Venallites* is easily known by the form of the anal cell.

We are still without a single Tachinid or Muscid s. str. from the Florissant shales. *Glossina* alone (two species) represents the whole series of Calyptrate Muscoids! In Coleoptera, we are still without a Histerid or Cicindelid. A *Cypris* is, so far, the sole representative of the Crustacea. The total number of species described is now so great that these blanks become significant. In the Neuropteroid series we have plenty of Ephemerids and Termites; numerous Raphidiids, Chrysopids and Hemerobiids; a Nemopterid and an Embiid; but as yet not a single Perlid. The Panorpids are represented by three species. We have no less than five species of the Dipterous family Nemestrinidæ, now so rare in this country. The quite numerous Bombyliidæ, as well as the very numerous Aphididæ, *all* belong to extinct genera; but the Phoridæ, Syrphidæ, Therevidæ, Leptidæ, etc., are referable to genera still living.

## Hymenoptera.

### *Alysia ruskii*, n. sp.

♀—Robust, length almost 5 mm.; anterior wings broad, broadly rounded at apex, nearly 4 mm. long; expanse about 9 mm.; head and thorax black; base of abdomen (apparently two segments) clear ferruginous, the rest black or dark brown; antennæ nearly 3 mm. long, dark, thick, the joints just before the end about as broad as long, with a diameter of about 110 microns; legs ferruginous, the hind femora incrassate, suffused with dark brown, the base broadly and apex more narrowly pallid; hind tibial spur long and sharp; head and thorax apparently closely but shallowly punctured;

parapsidal grooves of mesothorax distinct, entire; width of abdomen nearly 1½ mm.; wings hyaline, slightly dusky because minutely hairy all over, the hairs dark; nervures ferruginous, very distinct; costa not bristly; stigma large, about 720 microns long and 320 deep; a linear, hardly noticeable, costal cell; basal nervure leaving costa very obliquely near base of stigma, its lower part very strongly arched, its lower end only about 320 microns in a straight line from subcosta; marginal cell subtriangular, sharply pointed, about 930 microns long, its lower side beyond the submarginal cells faintly concave (bulging inward); first s.m. diamond-shaped except for the large part cut off by the stigma, its basal end only a short distance down nasal nervure; first section of radial or marginal nervure having stigma beyond middle, nearly at right angles; second section nearly obsolete, but marked by the bend in the nervure; second t.c. wholly obsolete, but marked at each end by an angle in the nervure where it should arise; recurrent nervure exactly meeting first t.c.; lower end of b.n. basad of t.m. a distance equal to rather more than half of latter; t.m. very oblique; second discoidal complete.

Florissant, in the Miocene shales (*Willard Rusk*). Type U. of Colorado Museum, 4903. Easily known from the two species described by Brues from the Florissant shales by the obsolete second t.c. Except for this the venation is nearly as in *A. petrina* Brues, except that the first section of radius is about as long as second, the marginal cell is narrower apically, the b.n. is strongly bent (straight in *petrina*), and the second s.m. has its apical corner more produced. The linear costal cell is not different from that seen in other forms in which this cell is described as "absent," because it is not readily seen without a microscope. According to Ashmead's tables, the absence of the second t.c. would throw it in Dacnusinæ; but, as Marshall observes, in true Dacnusinæ the radius beyond the first section presents an unbroken curve, without any angle where the second t.c. should be inserted. In the meeting of the a.n. and first t.c., *A. ruskii* resembles *Alysia* (*Goniarcha*) *atra* Hal., but that species has the first s.m. with a broad side on b.n. In the shape of the first discoidal cell, the fossil is suggestive of *Dacnusa* (*Phænolexis*) *petiolata* Nees.

*Alysia ruskii* should perhaps form a new genus near *Alysia*, but it seems better to leave it in *Alysia* sens. latiss.

*Heriades saxosus*, n. sp.

♂—Length about 7¼ mm., in a rather contracted state, the abdomen strongly convex dorsally in profile; head and thorax dark brown, probably black in life; abdomen lighter and redder; wings hyaline, very faintly dusky; anterior wings 4 mm. long; venation as in *H. sauteri* from Formosa, except that lower section of basal nervure is more arched, the marginal cell is considerably longer and more pointed, and the bend in the second t.c. is less distinct. As in *H. sauteri*, the second a.n. squarely meets the second t.c. The following measurements are in microns: Length of marginal cell 1152; depth of marginal cell 304; greatest (diagonal) length of first s.m. 768; second s.m. on marginal, 240; lower side of second s.m. 544; second s.m. on first discoidal 80; greatest (diagonal) length of first discoidal about 976. The basal nervure practically meets the transversomedial, which, as usual in Heriadines, is oblique, the lower end most basad.

Florissant, Colorado, in the Miocene shales; Station 14 (*W. P. Cockerell.*)

Among the fossil bees hitherto found at Florissant, this comes nearest to *Heriades laminarum* Ckll., but is smaller, with the second r.n. meeting second t.c., and the b.n. hardly falling short of the t.m. The apex of the marginal cell is pointed, if rather obtusely, not rounded. The first r.n. joins the second s.m. at a distance from its base equal to a little over a third of the length of the first t.c., the latter being about 224 microns long. The stigma is well developed.

## CONCERNING THE REPUTED DISASTROUS OCCURRENCE OF *VANESSA CALIFORNICA* IN OREGON AND CALIFORNIA

BY J. MCDUNNOUGH, DECATUR, ILL.

In the April number of the CANADIAN ENTOMOLOGIST, Prof. F. M. Webster of the Bureau of Entomology, Washington, D. C., recounts several instances of devastation of crops and foliage which he attributes to the larvæ of *Vanessa californica*. A careful study of the various letters quoted convinces us that in all but the last

instance the author is in error in determining the larvæ as belonging to this species.

In the Proceedings of the California Acadamy of Science, June 7th, 1875, Hy. Edwards gave a detailed account of the larva of *Californica*, citing the food plant as *Ceanothus;* according to this account the larva is jet black, *strongly spined* (a characteristic of all *Vanessa* larvæ) with five branched spines on each segment, the middle spine being bright-yellow at the base; at the bases of the spines are bright, steel-blue tubercles and between them numerous circular, whitish-yellow dots, giving the appearance of a yellow dorsal line. It is a well-known fact that the larvæ of the various *Vanessa* species are restricted to one or two food plants and it would be a most extraordinary proceeding if a Vanessid larva, normally restricted to *Ceanothus* as a food plant, should suddenly be found devastating alfalfa and garden truck.

Taking the various reports in order, we note from that of Mr. T. V. Hall of Lakeview, Oregon, that the "worm" which had destroyed the alfalfa crop was brownish colour, with *sleek* appearing surface. This description could hardly, even by the most ignorant, be drawn up from the jet black, heavily spined Vanessid larva; it could, however, easily apply to any one of the "cut-worm" species.

The next letter, from Mr. A. J. Swift of the the same locality, reports the occurrance of vast swarms of *californica* a month after the crops had been ravaged by a "worm" varying from bright green to nearly black, according to its food supply. There is nothing, except the imagination of the writer and the appearance of the butterfly at a later date than the larvæ, to connect the two. The swarms of the butterfly, which doubtless was *californica*, may be accounted for either as due to imaginary instincts or to the fact that the larvæ had actually bred in numbers on *Ceanothus* in the high valleys, a feature which would naturally not be observed by farmers, who are principally interested in their crops.

In the report from Mr. J. J. Menroe of Willow Ranch, California, we note one feature that would absolutely preclude the determination of the destructive larvæ as *californica*, i. e., the fact that they burrowed in the ground during the day, feeding by night. This is characteristic of "cut-worms" but unknown in Vanessid

larvæ, which remain on their food plants continually, usually feeding gregariously by day.

Mr. Webb's report from Waldo, Oregon, actually does deal with *californica*. He cites the larvæ as completely stripping the foliage off grease-wood and mountain lilac. We do not know just what is meant by this latter plant, but believe that *Ceanothus* is often locally called grease-wood. From this report it would seem that there is some danger, when vast numbers of the larvæ are present, of fruit trees being attacked, but it is apparent that only when the natural food supply is exhausted would this occur. We note that it is distinctly stated that "they seemed to care for nothing to speak of but grease-wood and lilac", and the fact that "tons" of them perished on water and land in their vain search for a further food supply only goes to support our previous statement that *californica* is very restricted in its choice for food plants and the idea of its being held responsible for damage to alfalfa and other crops may be banished as so improbable as to be almost ridiculous.

## ANNUAL MEETING OF MONTREAL BRANCH

The fortieth annual meeting of the Montreal Branch of the Entomological Society of Ontario was held at the residence of Mr. Henry H. Lyman on Saturday evening, May 17th. Mr. G. A. Southee, President, occupied the chair, seven members being present.

After the reading of the minutes and election of Mr. G. M. Henderson as a member the reports of the council and of the treasurer were read and adopted. The president delivered his annual address dealing with the good work accomplished by members of the branch in spite of the exceptionally unfavourable weather conditions, several new species and varieties of moths having been discovered as well as some rare captures, notably *Hepialus auratus*, the second Canadian specimen.

The election of officers resulted as follows: President, A. F. Winn; Vice-President and Librarian, G. Chagnon; Secretary, Geo. A. Moore; Treasurer and Curator, Henry H. Lyman; Members of Council, G. A. Southee, E. C. Barwick, G. H. Clayson.

Geo. A. Moore, Sec., 850 St. Hubert Street.

## FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 192.)

403. *A. excelsa* Ottol.—I have no local captures in my collection, but several from Banff, July 30th–August 19th (Sanson). Under the description Dr. Ottolengui mentions having three specimens from Laggan, and claims to have seen many more from there. I have one from Field, B.C., and a few from Kaslo. My series are all much alike, and one or two agree concisely with Ottolengui's figure. I have *angulidens* from Colorado, and, though closely allied, I believe they are distinct. The difference was pointed out by Ottolengui. I would say, in addition, that whilst in *angulidens* the outer stroke of the U portion of the sign is evenly out-curved, the outer stroke of the V in *excelsa* is either direct or in-curved for the lower two-thirds of its length. In both it has generally a slight inward hook at the tip. *Vaccinii* appears to be another very close ally. There was a series of that in the Washington collection from the White Mountains, N.H., in which the sign seemed to me very variable. Also associated with them, justly as far as I could judge, was an unset Kaslo specimen, recorded by the name in the Kaslo list. I have suspicions that this specimen was really *excelsa*.

I have what I feel sure is another slightly larger closely allied species from Kaslo and Nelson, B.C., which was recorded in the Kaslo list as "*u-aureum* Guen." but which was sent me subsequently by Mr. Cockle as "*u-aureum* of the Kaslo list, but *excelsa* by Dr. Barnes, compared with Ottolengui's naming." I feel sure that *excelsa* is wrong for this form, and I am by no means satisfied that it is *u-aureum*. Compared with both *excelsa* and *angulidens*, it has a wider open sign; in fact, more rectangular than V or U-shaped. I may call it a more *octoscripta*-like sign, more resembling that of *arctica* than of any other of Ottolengui's figures. The outer spot is in every specimen larger than in *excelsa*, and sometimes hollow—that is to say, dark filled centrally, and more often touches the outer line of the larger sign at varying points. It is a slightly larger species, but as regards the rest of the maculation and color of the primaries, there is really very little difference. The secondaries differ, however. In *excelsa* the secondaries may be described as dull fuscous, with a broad but ill-defined yellowish

white median band. The outer fuscous border is rather narrow, and the pale median band is fuscous suffused. My specimens of *excelsa* all agree exactly with Ottolengui's figure in this respect. In the other species the secondaries are better described as yellowish white, slightly fuscous at the base, and with a broad fuscous outer band, occupying the outer third of the wing. The central portion of the wing is thus much dirtier in *excelsa*, but the outer border narrower. On the underside *excelsa* is more suffused with gray and fuscous than the unknown species. The discal spot on secondaries beneath in *excelsa* is scarcely more than a point. In the unknown species it is obviously V-shaped. In both species spines are usually, but apparently not always, present on the hind tibiæ.

If the Kaslo specimens formerly recorded as *u-aureum* were subsequently named *excelsa* after a comparison with a co-type of that from Jefferson, New Hampshire, which my notes tell me I saw in the Washington collection, then it is possible that the co-type in question is not *excelsa*. Of course, Dr. Ottolengui may have mixed these two species in his description, but I am taking it for granted that his figure represents the type.

The Kaslo and Nelson specimens in question have a most remarkable resemblance to Mr South's most excellent photo-lithograph figures of *interrogationis* Lin., Pl. 26, figs. 4,5, of his "Moths of the British Isles,"Series ii.,though I appear to have overlooked the resemblance in the British Museum, if, indeed, I noticed the Linnean species at all. I had a Nelson specimen with me, and it did not satisfy me as agreeing with the *u-aureum* of that collection. I noticed several similar B.C. specimens there however, standing under more than one name. It differs most obviously from what I have listed as *octoscripta*, which it sometimes nearly resembles in the sign, by a totally different arrangement of color, the less crenate t.p. line, and the absence of blackish dashes both before and after the s.t. line.

I have seen specimens of it standing under *celsa*, described, I believe, from Oregon, and have two from Duncans, Vancouver Island, which appear to be the same species, though slightly larger and with sharper contrasts, one of which agrees with Ottolengui's figure of *celsa* in every detail except the sign. In this

one specimen, as in the figure, the inner part of the sign is V-shaped. Mine has, instead of a tail, a large round outer dot touching the lower angle of the V. The fact that one of my eight specimens has an almost V-shaped sign, and the rest have it nearer rectangular, does not indicate greater variation than exists in *californica* and other speciesin my collection. On the strength of this Duncans specimen, which I may remark bears some resemblance to a small *viridisignata*, it seems not unlikely that *celsa* may turn out to be at least one of the correct names for my Kaslo and Nelson species. I quite expect ultimately to find at least a close relationship to *interrogationis*.

As regards the great variation known to exist in the signs of some species of this genus, the late Mr. Tutt's remarks concerning *interrogationis* in the British Isles are interesting. "The great character in this species is the endless variation which the central silvery marks or characters undergo. Truly no two are alike, and to look down a long series at this mark, is something like looking at a series of Chinese characters. Some are like the normal mark in *iota* and *pulchrina*, composed of a V and a dot; others have them united as in *gamma*; others again are like the Greek $\epsilon$; one forms a tiny solid blotch as in *bractea*, and so on." (British Noctuæ and their Varieties, IV. 36, 1892.)

As to *u-aureum*, which Ottolengui claimed was not a North American species at all, and further remarked that the description associated it with *interrogationis* (Journ, N.Y. Ent. Soc. X. 69, June 1902), it may be observed that the only localities given for it in Staudinger's Catalogue are Greenland, Labrador, and North America. He also places "*Interrogationis* var. *grœnlandica* Staud." as a synonym. The types of *u-aureum* are probably in Mr. Oberthur's collection at Rennes. which by an unfortunate chance I just missed seeing in March 1912. Under the name in the British Museum were three specimens supposed to be North American. One had label "United States" at side. Sir George Hampson wrote me concerning the species: "Our specimens are from the Grote collection without exact locality. It is considered that the types really came from Labrador, and not from Dalecarlia, Sweden, as described." Concerning the Grote collection specimens, during my first visit to the British Museum early in 1909, I wrote,

"I can't distinguish them from *vaccinii*,"of which there was a ♀ from Mt. Washington. About this specimen I wrote: "Darker than the *u-aureum* series, but seems to me exactly like it." My sketch of the sign of the three specimens shows that it was exactly like some in my unknown species, which I call "*u-aureum* of the Koctenai list." But in February, 1912, I compared a Nelson, B.C., specimen with them and do not seem to have found that they matched it. This time my notes read: "The *u-aureum* of this collection is not improbably *zeta* Ottol., judging by the figure of the type of that, though the t.a. (in *u-aureum*) seems less even, and in none does the outer spot join top of sign. Secondaries are alike exactly, but basal area of primaries seems paler in *zeta*." The description of the latter was made from a single ♀ from"North West Territory" and came from Mr. Jacob Doll's collection. I have nothing to match it exactly, but it appears to be of this group.

406. *A. falcifera* Kirby—Dr. Ottolengui's remarks on this species appear correct. Kirby described the grey form from Nova Scotia, and *simplex*, of which the type is a female in the British Museum, from Trenton Falls, N.Y., is a very dark brown specimen. I have tried hard to recognize two species in these forms, noticing that most *falcifera* seemed to have a smaller and more slender sign. This difference is not constant, however, and I must admit that I can discover no other means whatsoever of separating them except by color, in which they grade easily through.

It seems hard to believe that *simplicima* Ottol., described from a single female from the State of Washington, is anything more than an unusually small *simplex*, with a sharp-pointed sign. His remark that the sign is "always knobbed in *falcifera* and *simplex*" is not correct. I have a Calgary *falcifera* in which it is sharp, though not quite as sharp as in the right wing of his figure of *simplicima*.

407. *A. orophila* Hamps.—Sir George Hampson, in CAN. ENT. XL. 105, March 1908, thus named the Rocky Mountain form previously passing as *diasema*. The description was made from six males and a female from Brobokton Creek, Alberta Rockies, and one male from Early Winter Creek, Washington Forest Reserve, all taken by Mr. Nicholl. The type is a male from the former locality, and is marked as taken at 5,500 feet, on July 10th, 1907.

Its describer remarks: "*Diasema* Bdv., . . . . . which is found in N. Europe and Asia, and in America from Greenland to Labrador, has the head, thorax and fore wing much more strongly tinged with red-brown, the last with the antemedial line excurved below the cell, the stigma more V-shaped, with a slight tail or point beyond its lower extremity; the hind wing with the terminal area, reddish-brown."

On my first visit to the British Museum, in January 1909, I found two Hudson Bay specimens and three others—one marked Lapland, standing under *diasema*. From notes I took on them I concluded on my return home that the Banff specimen I had recorded under the name was correct. Three years later I actually compared this specimen with the *diasema* series, and concluded that it fitted *orophila* better, and that, moreover, I had never seen true *diasema* from the Canadian Rockies at all. My series at present consists of a male and four females from Brobokton Creek, August 13th, 1907 (Mrs. Nicholl), Banff, August 13th, 1900, and August 1st, 1910 (Mr. N. B. Sanson and the author), and a pair from Kaslo, B.C. (Cockle), the female dated September 10th, 1907. I have also seen a Banff male from Mr. Sanson, dated September 1st, 1909, as well as more Kootenai specimens in Mr. Cockle's collection. The course of the t.a. line varies somewhat, and so does the size and shape of the sign. Both strokes of the latter vary considerably in their course, as well as in the amount of grey space which they define. The lower stroke may be almost direct, or slightly curved, or even almost obtusely angled at about its middle. The inner one may bend outwardly or inwardly, or both ways, and may so connect with the outer as to form either an even curve, an obtuse or a right angle, or a decided tail or point. Any specimens, however, which may have been named *diasema* by me have been so named erroneously.

409. The species referred to under this heading is not *snowi* nor does it bear any close resemblance thereto. It is *microgramma* Hbn., a European species not previously recorded from North America. I have compared a local specimen with a series in the British Museum. I referred to this in 40th Rep. Ent. Soc. Ont.,

p. 118, 1909. I have only two poor specimens left in my collection. On several occasions I have made special trips to the locality at about the time for its appearance, but have not been fortunate enough to meet with the species again. It is the size of *alticola* and *devergens*, in color and maculation not unlike *orophila*, except as to the sign, which much resembles that of *californica*. It is very distinct from anything else North American.

410. *Syngrapha alticola* Walk.—Walker's type from the Canadian Rockies (Lord Derby) is in the British Museum, and my specimens agree with it. They are labelled Laggan, Juiy 17th, 1904, and Wilcox Pass, Rockies, Alta., July 26th to Aug. 13th, 1907, Mrs. Nicholl. It flies at low altitudes (5,000 ft.), but I do not know how high it goes. Sir George Hampson, in CAN. ENT. XL. 106, March, 1908, records more of Mrs. Nicholl's captures on Mt. Assiniboine, Brobokton and Brazeau Creeks, Alta., and Kicking Horse Pass, B.C., and states that the species is quite distinct from European *devergens* Hbn. I have two specimens of the latter from the Swiss Alps, and have examined others, and believe his statement to be correct, though they are very close allies. *Devergens* has been recorded from Labrador, but I have not the literature by which to investigate either the record or the correct spelling of the name. Holland's figure of *devergens* is *parilis*.

411. *S. ignea* Grt.—I have seen neither description nor type of this species. Smith's Catalogue states that the type should be at Philadelphia, and Grote makes the same assertion in his 1895 list. Smith's reference of *ignea* to *alticola* is after Grote, who admitted that he had never seen Walker's type, and many have mistaken his species. My *ignea* is the same as that of the British Museum from the Grote collection, and the same as Holland's figure of *hohenwarthi*, misspelt, as elsewhere, *hochenwarthi*. The latter stands as distinct in all our lists. I have specimens from Alberta, Colorado, Utah, and several European localities, and am unable to recognize two species. *Divergens* Fabr. is given as a synonym by Smith and Grote, but the name is attributed to Hübner by Staudinger. I am unable to discover whether the latter name has any connection with *devergens*.

414. *Therasea angustipennis* Grt.—I have not seen the description of this species, but Hampson figures the type, a female from Bosque County, Texas. That has fewer whitish areas than any of my series, which are nearly all from Alberta, but is evidently the same species. In common with most species in this and allied genera, the males have usually much more white than the females. Some of my females have the olive brown shading on the costa from the base to the t.a. line, and in one it continues with scarcely a break to the t.p. In some the costa is almost clear except for three or four patches, some or all of which usually join the extensive brown region below the median vein. In males, the costa is on the average much cleaner, and the patches are much reduced, sometimes almost entirely lacking. Their position is sometimes indicated by distinct yellowish shades, which may extend faintly all along the costal area. Specimens with the yellow shades are var. *flavicosta* Smith, which was described as a species from five males and two females from Hot Springs, New Mexico; Colorado, and Montana. I have compared one of my specimens with all, or nearly all, the type material. A male type from Colorado in the Washington collection has the costa clear nearly to the apex, with very little yellow, indeed. The variation appears to be more common in the male sex. The species is by no means rare on the Alberta Prairies.

415–416. The specimens formerly referred to by me under these two headings appear to be all one species, *tortricina* Zeller, by the British Museum collection, which Hampson places in his genus *Tarachidia*. The typical form appears to be ochre yellow, which is my No. 416. Hampson mentions three varieties as aberrations. "Ab.I., with the markings almost obsolete," is *obsoleta* Grt., though Grote's type, from Illinois, happens to be itself obsolete, all except the left hind wing. "Ab. 2, *modesta*, grey brown, slightly suffused with yellowish white." This form occurs here, and is one described by Henry Edwards. "Ab. 3, *deleta*, dark brown, suffused with olive yellow scales, leaving the termen and cilia dark, almost without markings." I seem to have this form from here also, and it was likewise described by Henry Edwards. *Inorata* Grt. stands as a synonym. I have a series of eight specimens, taken on Pine Creek and on the Red Deer River prairie.

One is creamy whitish, as mentioned in my former notes. The series shows a gradation through.

*Fasciatella* Grt. is entirely distinct, and I have no authentic Canadian record. Hampson places it by itself in *Fruva* Grt. I have an Arizona specimen compared with the type in the British Museum, from Texas.

417. *Drasteria erechtea* Cram.—The species I have listed under this name is apparently that of which Holland figures both sexes on Pl. XXX., figs. 14 and 15, the latter figure as *crassiuscula*. Of local captures I have at present twenty-five males and three females.

418. *D. crassiuscula* Haw.—I have taken no more females than the one I previously referred to. Males, of course, I am uncertain about.

419. *D. distincta* Neum.—Under this heading in my previous notes, Vol. XXXVIII., p. 47, line 8 of the note, instead of "for these species," read "for three species." It was a printer's error, and the correction is an important one, as the point I wished to emphasize was not that I had gone to the trouble of verifying the names, as far as that was possible, but that I was under the impression that I had taken three allied species in Alberta. I have recently spent some hours studying the group again with the aid of material from other localities, and have found no reason to alter my opinion. Separation into three species in Alberta is quite easy, excepting, of course, with males of *erechtea* and *crassiuscula*, but I have much difficulty in coming to a decision about some outside material. For instance, I have males from the eastern coast which are superficially inseparable from my local males of *distincta*, but no females at all like mine, which differ very little from the males. From Vancouver Island I have females of *crassiuscula* and *erechtea* and a series of thirteen good males, which probably includes both. Another species from there is about the size of Alberta *distincta*, but shows very much stronger sexual dimorphism. The males are like dark and ochreous *distincta*, but the females are not unlike very small *crassiuscula*, though the subapical black marks are usually lacking. It seems not unlikely that we have a fourth

species in this group excluding *cærulea* and *conspicua*. Slingerland gives us to understand that there are some very marked differences in the male genitalia. Careful examination of numbers of these might give enlightenment, and, in addition to breeding, the forms require to be studied almost by the hundreds from various localities.

420. *D. annexa* Hy. Edw., syn *conspicua* Smith.—Edwards' type is a male in the British Museum, labelled "West U.S.A., Walsingham," and is the *conspicua* of Smith. It appears to agree structurally with *distincta*, and has all the tibiæ spined. It differs in several points of structure from *cuspidea*. My series has been reduced to two pairs, and I have no recent captures, though I occasionally notice it in the spring. I have seen it from Similkameen River in the collection of Mr. E. M. Skinner, of Duncans, B.C., and there is a specimen in the British Museum, taken by Mrs Nicholl in the Upper Keremeos. Both of these localities are in Southern British Columbia, near the border of Washington. It occurs at Banff.

421. *Euclidia cuspidea* Hbn.—I have a specimen from Edmonton, taken by Mr. F. S. Carr.

422. *Syneda hudsonica* G. & R.—The species is not *limbolaris*, which is correctly figured by Holland. No. 422 stands correctly named in the Neumœgen and Henry Edwards collections. It was described from the Hudson Bay Territory. I have not seen any type, but both sexes are figured with the description, and appear to be this species. This is not the form figured by Holland as *hudsonica*, which is referred to under No. 424. The female is quite unlike the male, having the primaries much more evenly grey, sometimes quite a blue-grey, with the maculation blurred, indistinct. In this respect it differs strikingly from No. 424, formerly listed as *hudsonica*, and in which the sexes are superficially alike. It is not uncommon on the prairie, and occurs in Manitoba, but I do not seem to have met with it here in the hills. A day flier.

(To be continued.)

Mailed July 8th, 1913.

# The Canadian Entomologist.

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## THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The Ontario Agricultural College, Guelph, is the scene from year to year of many notable gatherings. At the end of August there is to be a somewhat remarkable assembly, when the Entomological Society of Ontario holds its fiftieth annual meeting, at which a number of eminent entomologists are expected in celebration of the Jubilee. Scientific societies and institutions in many parts of the United States are sending delegates, and some are also coming from Great Britain. The Universities of Edinburgh and Manchester are to be represented, and also the Natural History Department of the British Museum, the venerable Linnæan Society of England and the Entomological Society of London and the Entomological Society of South London. Also delegates from entomological societies in various places. It is somewhat remarkable that the two men by whose efforts the Society was formed half a century ago are still in active work, and will be present at the meeting, namely, Dr. William Saunders, who established the experimental farms of the Dominion, and was for twenty-five years director, and Professor C. J. S. Bethune, of the Agricultural College, who is President of the Society for the current year. In addition to those referred to, there will, of course, be a large representation of Canadian entomologists from all parts of the Dominion. The meeting will begin on Wednesday, August 27th. During that afternoon the delegates will present their congratulatory addresses, and Dr. Saunders and President Bethune will give some reminiscences of the formation of the Society and its early days. That evening a social reception will be given to the visitors by President and Mrs. Creelman at their residence in the College. Thursday morning will be taken up with the reading of papers and addresses, and the afternoon in motor excursions in the neighbourhood or visits to the College buildings. On Thursday evening a public lecture will be given in Massey Hall.

On Friday, the 29th, the visitors will be taken to Grimsby and given an opportunity of seeing the results of economic work in the Niagara fruit district. As the Toronto National Exhibition will be going on that week, reduced railway fares will be available from many points to that city.—C. J. S. B.

## NEW SPECIES AND NEW LIFE HISTORIES OF EPHEMERIDÆ OR MAYFLIES.

BY W. A. CLEMENS, TORONTO, ONT.

While at the Go Home Bay Biological Station on Georgian Bay, during the summer of 1912, I made a special study of the Ephemeridæ of that district, under the direction of Dr. E. M. Walker, to whom I am much indebted for advice and kindly criticism. A full account of the investigations will appear in the report of the Marine Biological Stations of Canada, this paper being confined chiefly to new species and new additions to the life-histories of several forms.

The work was carried on from May 25 to September 10, and consisted chiefly in the collecting and rearing of nymphs or larvæ. Collections were made in as varied localities as possible, as there are nymphs for almost every condition of fresh water. The nymphs were taken to the laboratory in jars or bottles of water, where they were examined under the binocular microscope and the species separated. A number of each species were then transferred to breeding jars, which consisted of glass vessels, fitted up as nearly as possible to the conditions in which the nymphs were found, and supplied with running water. Over the jars, wire cages were placed to catch the subimagos as they emerged. As the subimagos appeared, they were transferred to other vessels, where they were kept until the final moult, which usually took place in a day or two. The imagos were killed with potassium cyanide and then preserved dry or in alcohol. The subimago exuvial and final nymph sloughs were also preserved for future reference. In this way about 180 specimens were bred out during the summer. The following is a list of the forms taken:

Subfamily: Ephemerinæ
1. *Hexagenia bilineata* Say.
2. *Ephemera simulans* Walker.

Subfamily: Heptageninæ
1. *Heptagenia flavescens* Walsh.
2. " *lutea* sp. nov.
3. " *fusca* sp. nov.
4. " *tripunctata* Banks
5. " *rubromaculata* sp. nov.
6. " *luridipennis* Burm.
7. " *canadensis* Walker
8. " *frontalis* Banks.
9. " sp.? (nymphs only).
10. *Ecdyurus maculipennis* Walsh.
11. " *lucidipennis* sp. nov.
12. " *grandis* sp. nov.

Subfamily: Baetinæ
1. *Baetisca obesa* Walsh.
2. *Leptophlebia*, sp.? (nymph only).
3. *Blasturus cupidus* Say.
4. *Blasturus nebulosus* Say.
5. *Choroterpes (?) basalis* Banks.
6. *Ephemerella lutulenta* sp. nov.
7. *Ephemerella lineata* sp. nov.
8. *Ephemerella bicolor* sp. nov.
9. *Drunella* sp.? (nymph only).
10. *Cœnis diminuta* Walker.
11. *Tricorythus allectus* Needham.
12. *Chirotenetes albomanicatus* Needham.
13. *Siphlurus flexus* sp. nov.
14. *Baetis propinquus* Walsh.
15. *Clœon dubium* Walsh.
16. *Callibætis ferrugineus* Walsh.

## Descriptions and Notes.

### Genus Heptagenia

Special attention was given to this genus on account of its abundance and the comparatively large number of species. The

nymphs of eight species were taken and imagos reared, three of which are new species and the nymphs of the other five have not previously been described. The Heptagenia nymphs were the dominant forms in the swift waters and along the exposed shore. Their bodies are very much flattened, legs spreading, femora flattened, claws pectinated, gills placed dorsally in an overlapping series, and eyes on dorsal surface of head, and so are adapted to a life in the swiftest water. They are able to cling very tightly, for when they are lifted from a stone, quite a resistance can be felt. The clinging habit is very strong, for if a number are placed in a vessel of water without anything else to cling to, they begin clinging to each other and are soon all in a mass. They are quite active and are able to scurry over the surface of a stone, even going sideways and backwards. Their food consists of the various algal forms on the stones to which they cling.

A Heptagenia probably completes its life cycle in a year. It spends all its life in the water except for four or five days as subimago and imago. The egg hatches in about 40 days. This calculation is based upon the fact that about two months after the appearance of the imagos of *H. tripunctata* the small nymphs of the next generation were found, and this is the time required for the eggs of *Hexagenia bilineata*. The nymphs moult about once every two weeks, and as the time of emergence approaches, they probably migrate into quieter water. I have not observed the emergence of a Heptagenia subimago in the open, but in the laboratory the nymphs would crawl up the sticks placed in the jars for the purpose and transform just above the water level. The subimago stage usually lasts a day, but occasionally only a few hours and in the early part of the season it frequently lasted three or four days. Temperature and humidity seemed to be important factors. The imagos commenced their flight shortly after sundown along the lake shore, dancing in their rhythmic up and down manner at a height of from 12 to 20 feet. The females deposited their eggs by flying over the surface of the water and brushing off the eggs into the water as they appeared from the openings of the oviducts. Of the eight species the first to appear was *H. tripunctata* about June 1, and the last, *H. luridipennis*, September 2.

There are two distinct groups. In the first, consisting of *H. tripunctata*, *H. luridipennis*, *H. flavescens*, *H. lutea*, *H. fusca*, *H. rubromaculata*, the nymphs are characterized by having the lamellæ of the gills oblong, claws usually pectinated, distal segment of maxillary palpus thickest about its middle and with a small tuft of bristles near its distal end. The body is much flattened and the colour olive brown or greenish yellow. The male imagos have the penis lobes rather L-shaped and the second and third tarsal segments of the fore legs are equal, while the fourth is about four-fifths the length of the second. In the other group, consisting of *H. canadensis*, *H. frontalis*, and a third undetermined species represented by the nymph only, the nymphs have the lamellæ of the gills oval and produced distally into a sharp point; the claws are not pectinated, the distal segment of the maxillary palpus thickest towards the distal end and the tuft of bristles larger than in group 1. The body is less flattened, more reddish or yellowish, and has the appearance of being striped longitudinally on dorsal surface of abdomen. The male imagos have the penis lobes oblong instead of L-shaped and the second and third tarsal segments are not quite equal, while the fourth segment is about half the length of the second.

The following keys will serve to separate these eight species:

Key to Male Imagos:

A. No black spots or bands on face below antennæ. Group 1.

B. Very pale species.

C. Notum ferruginous, stigmal dots distinct..... *H. flavescens.*

CC. Notum lighter, no stigmal dots.....*H. lutea.*

BB. Dark species.

D. Large, entirely brown species.

E. Thorax with a broad dark median stripe or two narrow stripes close together..... *H. verticis.*

EE. Thorax without dark median stripe.....*H. fusca.*

DD. Not entirely brown.

F. Two very small dots on median carina between antennæ.....*H. tripunctata.*

FF. No dots on median carina; thorax and top of abdomen dark.

G. Reddish area in pterostigmatic space of wing...*H. rubromaculata.*

GG. Without reddish area in wing....*H. luridipennis.*

AA. Two black spots or bands on face below antennæ. Group 2.

H. A black band on face below antennæ, a dark dash in wing, abdomen dark..*H. canadensis.*

HH. A black spot on face below antennæ, no dash in wing, abdomen lighter..*H. frontalis.*

Key to Nymphs :

A. Gills oblong. Group 1.

B. Nymphs entirely brown, without a distinct dorsal colour pattern.

C. An inverted dark U-shaped mark on ventral surface of 9th segment and a dark spot on ventral surface of the 8th. Dorsal surface of body has a smooth appearance.....*H. flavescens.*

CC. A row of dark mushroom-shaped marks along ventral surface and a rectangular dark mark on 9th. Dorsal surface has a rather granular appearance and lateral margins of body quite hairy.....*H. rubromaculata.*

BB. Nymphs not entirely dark brown and have a distinct colour pattern.

D. Ventral surface of abdominal segments banded with dark bands along posterior margins.

E. Broad dark bands at posterior margin of each segment on dorsal surface.....*H. fusca.*

EE. Dark bands at posterior margins of segments 7, 8, 9 and 10; not as broad as preceding species and a more elaborate colour pattern.....*H. lutea.*

DD. Ventral surface not banded.

F. Two rows of black dots along ventral surface of abdomen.....*H. tripunctata.*

FF. No dots.....*H. luridipennis.*

AA. Gills oval and pointed. Group 2.

G. Two light longitudinal stripes on dorsal surface of abdomen close to median line.

H. Stripes fairly uniform for entire length. Reddish species ....*H. canadensis.*

HH. The stripes not of uniform width, very wide on 8th segment, very narrow on 5, 6 and 7, so that darker intermediate parts have oval shapes. Lighter species. *H. frontalis.*

GG. Dorsal surface of abdomen has appearance of three longitudinal dark stripes. Colour greenish yellow. *H.*, sp. undetermined.

Mr. Nathan Banks kindly identified the imagos for me and loaned me specimens of *Heptagenia verticis, H. luridipennis* and *H. terminata*, for comparison.

*Heptagenia flavescens*, Walsh.

Nymph.

Measurements: Body 8-9 mm.; setæ 10-13 mm. Head brown, very slightly covered with light dots; a light spot above each ocellus; a small light dot on each side of median ocellus; an irregular light area anterior and lateral to each eye. Pronotum brown, with two light spots on each side. Mesothorax similar in colour to prothorax. Abdomen of a uniform brown colour dorsally, having a smooth appearance; lighter ventrally, with a semicircular brown band on 9th segment and a median brown spot on 8th. Spines of lateral edge short. Setæ banded, usually three segments dark and one light, sparsely fringed, usually only at base of light segment. Femora much flattened, brown and dotted with light spots, and having three irregular light bands; covered dorsally with small spines and posterior margin fringed with hairs and spines. Tibia with median and distal light bands. Tarsus tipped with white. Claws with two pectinations.

The nymphs of this species were taken up the Go-Home River on June 16, 1912, immediately above Flat Rock Falls, where the water was flowing swiftly but smoothly. They were clinging to stones in water one to one-and-a-half feet deep not far from the shore. On the same date they were found just below Sandy Gray Falls, two miles farther up the river. Here the water was swift and rough. I was successful in rearing only two specimens, the dates being June 27 and July 3.

*Heptagenia lutea*, sp. nov.

Male imago.

Measurements: Body, 9-10.5 mm.; wing, 10.5 mm.; setæ, 20; fore leg, 10.

This is a light-coloured species, slightly reddish on face below antennæ; reddish brown between ocelli and eyes. Thorax almost whitish yellow dorsally, light yellowish brown laterally; a dark area on each side of pronotum, slight red and brown markings below bases of fore and hind wings. Each abdominal segment 1-8 banded dorsally at posterior margin, remaining part of these segments being almost white; segments 9 and 10 entirely reddish brown; stigmal dots not marked; wings clouded in pterostigmatic

space, a few cells reddish. Femora with median and apical bands; tibia-tarsal and tarsal joints black; fifth tarsus and ungues dark.

Female imago.

Measurements: Body, 11 mm.; wing, 12; setæ, 22; abdomen more yellowish than male.

Nymph.

Measurements: Body, 10 mm.; setæ, 13-16 mm. Head, light brown in colour and dotted with light dots; light areas over ocelli; another at posterior margin of head in median line and a larger one lateral to each eye. Pronotum with a broad, colourless lateral margin; remainder light brown, with numerous irregular light spots. Abdomen darker dorsally and with a rather complicated colour pattern. First segment light, with two brown areas at side; second with a narrow brown band along posterior margin and five brown areas and four light ones placed alternately; third almost entirely dark, with a few light dots; fourth with two dark spots in posterior lateral angles of segment, also a large dark area in centre of segment with a light area within it; fifth with a dark spot in each posterior lateral angle as in preceding segment, a dark band along posterior margin, two light areas surrounded with brown and a dark spot in centre of each; sixth almost entirely brown except for two light areas in anterior lateral angles; seventh with two large light areas, with a brown dot in each toward inner side; eighth an irregularly light and dark coloured segment; ninth has a narrow brown band along posterior margin and a dark longitudinal stripe in median line; tenth almost entirely dark. Ventrally, the lateral and posterior margins of segments 2-8 dark; segment nine with two large brown spots. Setæ greenish; basal half well fringed at joints, distal half with each two segments alternately light and dark and few hairs at joinings. Femora with alternately light and dark irregular bands and covered with minute spines dorsally; posterior margins fringed with hairs, anterior margins also fringed, but hairs shorter. Proximal ends of tibiæ dark and have dark bands slightly beyond middle. Tarsi with reddish-brown bands very near proximal ends. Claws with two pectinations.

These nymphs were very abundant along the open shore of Station Island and west of it, my collection dating from June 3 to July 2. A few were taken in a rapid on the Muskosh River on June

30 and several small specimens from Sandy Gray Falls, August 23. Imagos were reared from June 27 to July 3.

*Heptagenia fusca*, sp. nov.

Male imago.

Measurements: Body, 10 mm.; wing, 13; setæ, 26; No markings on face; ocelli almost in a straight line, the middle one the smallest. Pronotum brown, slightly darker along the median line; mesothorax uniformly brown. Abdomen with posterior one-third of each segment of same brown colour as thorax and projections from this band anteriorly in the median line, almost forming a continuous longitudinal stripe on the abdomen; the band widens laterally also; remaining portions of each segment somewhat light brown; ventrally very slightly banded. Forceps and penis lobes of usual form. Femur banded in middle and at distal end. Wings large; costa, subcosta and radius light in colour, while remainder of longitudinal and the cross veins brown. No cloud in pterostigmatic space.

Female imago.

Measurements: Body, 10-12 mm.; wing, 14 mm.; setæ, 18; Quite similar to male, except that abdomen is considerably darker.

Nymph.

Measurements: Body, 12-14 mm.; setæ, 15-20; antennæ, 3. Head brown, dotted with light spots; usually three light areas at posterior margin between eyes and two lateral to each eye; anterior margin well fringed with hairs. A light longitudinal median line on pronotum; two light areas on each side and lateral margin colourless; remainder of pronotum brown, with small light dots. Posterior one-third of each abdominal segment 6-10 almost black; segments 1-6 brown; the remainder of each segment varying from light brown to greenish yellow; ventrally posterior one-fourth of each segment 2-8 brown; ninth segment has two dark areas laterally. Femur light brown on upper surface, with a few lighter areas and covered with minute spines dorsally; posterior margin fringed with hairs; proximal end of tibia dark brown and its third quarter dark; proximal half of tarsus dark. Setæ well fringed with hairs at the joinings.

While on a canoe trip up the Go-Home River, June 16th, I collected a number of the nymphs of this spaces just below Sandy

Gray Falls. The only imagos I have are those bred from this collection. The dates of emergence are June 23rd and 24th.

This species is close to *H. verticis*, but lacks the dark median stripe on the thorax, and does not show the slightest trace of a dash in the wing under the bulla.

*Heptagenia tripunctata*, Banks.

Nymph.

Measurements: Body, 11-14 mm.; setæ, 12-16. Head deep brown, occasionally almost dark dotted with light spots; three light spots; three light areas along anterior margin of head and one at posterior margin between eyes. Pronotum similar in colour to head, with light dots and about five larger light areas on each side; lateral with a light area which extends inwards some distance. A light area in antero-lateral angle of mesothorax. Femur stout, with five irregular light areas; small spines very numerous; posterior margin fringed with hairs. Tibia with two dark and two light areas, arranged alternately. Abdomen similar in colour to head and thorax; a light area on segments 4 and 5 containing a small triangular dark area at anterior margin of segment 5, lateral to which are two dark dots; another light area on segments 7, 8, 9 and 10 containing two dark dots on 8th and two on 9th segments; usually three small dark dots at posterior margin of each segment. Ventrally two longitudinal rows of dark dots, increasing slightly in size toward posterior end; segment 9 usually with two pairs, the anterior pair small, posterior pair larger. Setæ with alternate dark and light areas. Gills have the lamellæ slightly rounded at distal end.

The nymphs of this species were seldom found in swift water, but were everywhere abundant about Go-Home Bay, in quiet bays, along open shores and in quiet streams. They could be found at any time during the summer. The first bred specimens emerged May 31, but the first capture was not made until June 11. On this date a small swarm of about 20 individuals was discovered about 8.15 p.m. flying from 10 to 20 feet high along the shore of Station Island, facing north. One female and several males were taken. Soon after this they became very abundant and remained so until about July 5th. The last bred specimen is dated Aug. 13.

*Heptagenia rubromaculata*, sp. nov.

Male imago.

Measurements: Body 8 mm.; wing 8; setæ 17; fore leg 7. No markings on face; darker spot at posterior margin of head between eyes. Thorax dark; median longitudinal dark stripe on pronotum; dark brown stripe on coxa of fore leg and extending up the side of prothorax. Abdominal segments 1-7 light; 8-10 dark, similar to thorax; each segment banded at posterior margin; stigmal dots distinct; wing has a reddish area in pterostigmatic space.

Female imago.

Measurements: Body 9-9.5 mm.; wing 13-14; setæ 15-22; often slightly reddish on face beneath antennæ. Dark brown on dorsal surface of head behind ocelli. Abdomen varies from reddish to a yellowish colour in dried specimens.

Nymph.

Measurements: Body 9-10 mm.; setæ 10. Head dark brown, dotted with minute light spots. Pronotum similar in colour to head; two light areas on each side, the outer one sometimes joined to the light margin. Abdomen dark brown, with a granular appearance; sometimes a faint, broad, dark, longitudinal streak can be made out with two dots on each side of it on each segment excepting 9 and 10; ventral surface lighter, with a median row of irregular dark spots and lateral rows of small dots or lines; the median dots are sometimes broken up so that only four or five small dots remain in its place; on segment 9 the markings are usually joined, forming roughly three sides of a square. Femur with four irregular dark bands; both posterior and anterior margins very hairy; claws pectinated. A very hairy species, having anterior margin of head, sides of thorax and abdomen very hairy.

This nymph was first taken on June 15 in what is commonly called the Narrows, near the mouth of the Go-Home River. The water here had a well-marked current, but not swift. On June 30 I found them very numerous in the very swift water of a rapids near the mouth of the Muskosh River. Nearly a month after this, on July 20th and 22nd, I discovered mature nymphs at an old lumber chute on the Go-Home River in fairly swift water. Imagos were bred from the nymphs taken at the Narrows on June 22nd and

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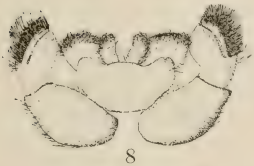
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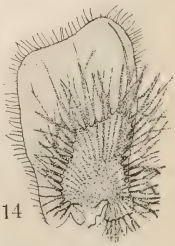
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MAYFLY STRUCTURE (CLEMENS).

25th; in the Muskosh Rapids from July 3rd to 5th, and at the Chutes, July 24-29th.

*Heptagenia luridipennis*, Burm.

Nymph.

Measurements: Body 7-8.5 mm.; setæ 10-14. Head brown, with light dots; anterior margin fringed with hairs. Prothorax similar in colour to head; on pronotum a light spot on each side of median line; lateral to this another larger one, and lateral to this another which extends to the lateral margin. Abdomen similar in colour to prothorax; a row of black dots on each side corresponding to the stigmal dots of imago; segment 3 for the most part light, with a round brown spot in the median line and with two short projections laterally; segment 4 with a small triangular brown spot in median line with base to anterior margin, while apex meets a large brown area, leaving a small light area on each side of triangle; lateral to the brown area is a light one, and lateral to this again is a triangular dark spot in the posterior angle of the segment; segment 5 much like the 4th; segment 6 entirely dark, except for two small spots at anterior margin and two toward lateral margin; segment 7 with a triangular dark spot in median line, with base to anterior margin and apex reaching about middle of segment; on each side of triangle two dark spots; segment 8 similar to the 6th; segment 9 irregularly marked; roughly, it is dark, with a darker median longitudinal line, two light spots on each side and another at lateral margin; segment 10 entirely dark; ventrally there are two dark spots at lateral margins of 9th segment, just beside the lateral spines of that segment; sometimes a triangular spot in median line also. Setæ with basal half fringed with hairs.

This was the last species to be taken. On August 23rd I found them in a rapid just above Sandy Gray Falls, where the river flows through a small gorge. I was successful in rearing quite a number of imagos, dating from August 28th to September 1st. These are slightly smaller than those Mr. Banks sent me and considerably smaller than the measurements given in various descriptions.

*Heptagenia canadensis*, Walker.

Nymph.

Measurements: Body 11 mm.; setæ 15; antennæ 3.5. Head reddish brown in colour; a small dark area immediately in front of

each antenna, and another about the same size in front of each eye, a black dot behind each lateral ocellus; a light area in front of median ocellus, and a larger light area between each lateral ocellus and eye; another lateral to each eye along margin of head. Mouth parts of the type belonging to group 2. Pronotum reddish brown, with a dark and an approximate light area in each lateral half; margin colourless. Abdomen darker than thorax; each segment with four light longitudinal streaks, two near median line and the other two near lateral margin; black dots, corresponding to the stigmal dots just inside the lateral light streaks. Ventrally the abdomen is almost white, each segment has two light brown lateral streaks, while the 9th has its lateral and posterior margins margined with light brown. Short lateral spines at posterior lateral angles of segments 8 and 9. Setæ of equal length; light brown in colour; joinings fringed with hair. Gills oval and pointed. Femur of fore leg light brown, with four light areas; two small ones toward anterior margin and two large ones toward posterior; distal end light coloured. Femora of hind legs with fewer pale markings. Tibiæ alternately banded with brown and white; tarsi have very broad median bands; legs slightly hairy along posterior margin.

This species was very abundant at Go-Home Bay, being next in numbers to *H. tripunctata*. The nymphs were taken from May 25th to July 10th in various localities, but never in swift water, the usual place being quiet bays. Small nymphs of the next generation were found on September 5th. The first bred specimen is dated June 1st and the last July 4th. Imagos were most abundant at Station Island from June 25th to July 15th.

*Heptagenia frontalis*, Banks.

Nymph.

Measurements: Body 9-10 mm.; setæ 9-10; Head yellowish brown in colour; three almost round light spots along anterior margin of head; usually a light area in front of each ocellus, and another along median line between eyes and two smaller ones lateral to this along posterior margin of head. A black dot below each antenna, in front of each eye and near inner margin of each eye. Thorax lighter in colour than head; on each side of pronotum, near median line, is a small light spot; just lateral to this is a

triangular dark spot, and lateral to this again is another light area; in anterior angle of pronotum is an oval light spot; along posterior margin extending some distance on either side of median line is a broad light band, which is connected by a light longitudinal stripe along median line of mesonotum to a large irregular light area on the mesonotum. Abdomen usually a light yellowish brown; the colour pattern roughly has the appearance of a broad light band along median line, in which in segments 5, 6 and 7 are oval dark areas; in 8, a narrow stripe, and in 9 a round, dark area in each segment; on either side of this broad light band is a short light stripe; ventral surface almost white, with two lateral light brown longitudinal stripes on segments 1-9; a broad band across 9th along posterior margin, joining the two lateral stripes. Segments of setæ alternately light and brown. Legs pale, colour pattern similar to *H. canadensis*.

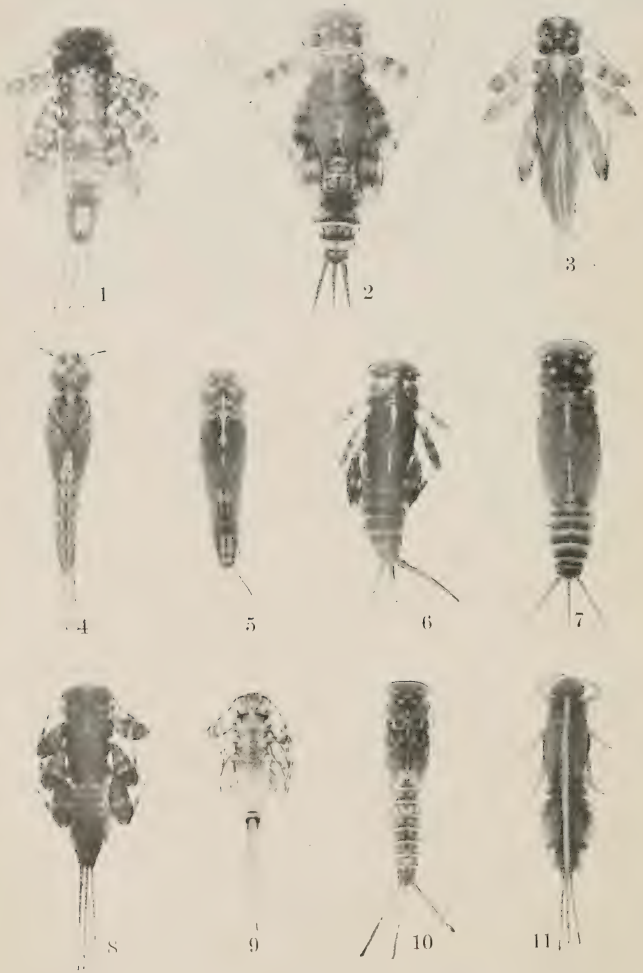
This species was not nearly so abundant as *H. canadensis*. The nymphs were taken in similar localities, but were not so widespread or plentiful. They were found from July 15th to July 2nd and imagos were reared from June 26th to July 4th.

*Heptagenia*.....? (undetermined).

Nymph.

Measurements: Body, 10-11 mm.; setæ, 12-13.; head, light brown; sometimes three light areas along anterior margin, but frequently the middle one is lacking and the two lateral ones are connected with the light margins lateral to the eyes. An almost black spot in centre of each half of pronotum; around this is an irregular light area, exterior to which is a brown area. Abdomen whitish yellow, with five longitudinal yellowish brown stripes in each segment 1-8. Setæ light greenish yellow; joints abundantly fringed with hairs. Legs yellowish brown in colour; pattern similar to the two preceding species.

These nymphs were collected along the east shore of Manitoulin Island on June 26th, 1912, by Mr. R. P. Wodehouse, who kindly handed them over to me. As imagos were not reared, the species cannot be determined at present.




MAYFLY NYMPHS (CLEMENS).

MAYFLY NYMPHS (CLEMENS).

## Explanation of Plates.

### Plate V.

*Photographs of Mayfly Nymphs.*

Fig. 1. *Heptagenia tripunctata* Banks.
Fig. 2. *Heptagenia lutea* sp. nov.
Fig. 3. *Heptagenia canadensis* Walker.
Fig. 4. *Heptagenia* sp ?
Fig. 5. *Heptagenia frontalis* Banks.
Fig. 6. *Heptagenia rubromaculata* sp. nov.
Fig. 7. *Heptagenia fusca* sp. nov.
Fig. 8. *Heptagenia flavescens* Walsh.
Fig. 9. *Heptagenia flavescens* (ventral view).
Fig. 10. *Ecdyurus pullus* sp. nov.
Fig. 11. *Ephemerella lineata* sp. nov.

### Plate VI.

Fig. 1. *Nymph Hexagenia bilineata* Say.
Fig. 2. *Nymph Heptagenia luridipennis* Burm.
Fig. 3. *Nymph Ephemerella bicolor* sp. nov.
Fig. 4. *Ecdyurus maculipennis* Walsh.
Fig. 5. *Nymph Ecdyurus lucidipennis*, sp. nov.
Fig. 6. *Nymph Bœtis propinquus* Walsh.
Fig. 7. *Nymph Cloeon dubium* Walsh.
Fig. 8. Venation of wing pad of nymph of *Siphlurus flexus* sp. nov.
Fig. 9. Fore claw of nymph of *S. flexus* sp. nov.
Fig. 10. Fore claws of imago of *S. flexus* sp. nov.
Fig. 11. Wings of *Siphlurus flexus* sp. nov.

### Plate VII.

Mouth parts, gills and genitalia of *Heptagenia canadensis* and *H. tripunctata*.

Fig. 1. Labium and 2nd maxilla, *H. canadensis*.
Fig. 2. First maxilla, *H. canadensis*.
Fig. 3. Mandible, *H. canadensis*.
Fig. 4. Labrum, *H. canadensis*.
Fig. 5. Hypopharynx, *H. canadensis*.
Fig. 6. Genitalia, *H. canadensis*.

Fig. 7. Gill, *H. canadensis.*
Fig. 8. Labium and 2nd maxilla, *H. tripunctata.*
Fig. 9. First maxilla, *H. tripunctata.*
Fig. 10. Mandible, *H. tripunctata.*
Fig. 11. Labrum, *H. tripunctata.*
Fig. 12. *Hypopharynx, H. tripunctata.*
Fig. 13. Genitalia, *H. tripunctata.*
Fig. 14. Gill, *H. tripunctata.*

(To be Continued.)

## A JUMPING MAGGOT WHICH LIVES IN CACTUS BLOOMS (*ACUCULA SALTANS*, GEN. ET SP. NOV.).

BY CHARLES H. T. TOWNSEND,
Director of Entomological Stations, Lima, Peru.

On January 25, 1913, the writer was exploring a rocky draw among the bare hills in the western base of the Andes, above Santa Ana ranch house, about forty miles inland from Lima, and at about 4,000 feet elevation above sea. In this draw a columnar cactus was found growing in bunches, probably *Cereus* sp., which at that date showed few blooms opened, but many unopened buds. One large bud evidently past opening time, and in reality a bloom whose opening had been prevented by the shrivelling of the petals which effectually closed it, was cut open and disclosed five maggots that possess the power of jumping six or eight inches high from a hard surface. The cactus buds were all numerously attended by a large brown ant, specimens of which have been sent to Dr. Wheeler for determination, and the closed bloom containing the maggots was simply massed with the ants on the outside, much more so than the buds in general, yet no entrance had been effected by them into this bloom. The bloom was cut open with the idea that the ants were inhabiting it, and thus the discovery of the maggots was purely accidental. The maggots were found to be boring among the clotted mass of stamens and anthers. Fermentation of the mass was evident from the sour odour, but no actual putrefaction had taken place. The maggots had not penetrated the septum covering the

ovarial chamber, and the developing seeds appeared to be in normal condition.

Description of Third-stage Maggot.—Length, extended, 9 to 10 mm. Pale yellowish or straw-colored, anal plates and cephalopharyngeal skeleton black. Mandibular hook double, not coalesced. Anal plate in one transverse piece of chitin, with a sharp spine pointed upward from each end. Anal stigmata situated one on each side in end of anal plate next to and just inside of the spine. At outer end of anal plate on each side is a chitinous black ocellus. Ventral surface of body has spinose areas at junction of segments, being eleven half rings of microscopic spines, the front one faint and situated opposite the pharyngeal sclerites, the hind one on the subanal proleg-like hump or tubercle. Dorsum of body without spines or spine areas. Thirteen segments appear marked by integumental divisions, and counting the apparent second segment as II. and III. the total is fourteen, XIII carrying the subanal tubercle and XIV. the anal plate, though the last is small and ill-defined.

The maggot jumps by curling the body until the head and anal plate meet, the mandibular hook being appressed ventrally to the dorsal surface of the anal plate, whose lateral hooks are dorsally directed, the anal plate being then forcibly thrust free from the mandibular hook by a sudden and rigid straightening of the body from the anal end, while the mandibular hook is maintained continuously at resistant tension. This produces the leap, probably after the same manner as in the maggot of *Piophila*. While the body is curled, the ventral surface represents the concavity and the dorsal the convexity of the curve assumed. Probably this jumping power of the maggot has been developed for the purpose of escaping the ants or other enemies when the flower is abandoned for pupation in the soil.

On January 26 the maggots were found to have issued from the bloom. Soil was supplied to three of them, into which two of them immediately entered, but the third had already begun to contract for pupation and remained on the surface. Issuance had not taken place up to some fifteen or twenty days after, but on February 27 the three flies were found issued, perfectly transformed, and dead. The pupational period is evidently close to

three weeks. The fly is of unusual interest on account of the long and extremely needle-like ovipositor of the female.

ACUCULA, gen. nov.

Head flattened or shortened-subhemispherical, in form approaching that of *Milichia*, but longitudinal axis less. Front of male about three-fifths of eye-width, that of female about eye-width. A pair of reclinate and slightly convergent vertical bristles, a pair of reclinate orbitals in front of ocelli, a pair of proclinate ocellar bristles, these all being equal in strength and length; rest of parafrontals with fine hairs half the length of the bristles. Antennæ inserted below eye-middle, reaching about three-fifths way to oral margin, third joint somewhat elongate, arista short-pubescent. Peristomalia with five or six equal bristles, the vibrissæ not differentiated. Eyes descending to lower margin of head in profile, the cheeks narrow. Proboscis and palpi short, not exserted, the oral cavity rather pronounced.

Mesoscutum with bristles near posterior border only, short hairs on rest; scutellum subtriangular but rounded apically, bearing a pair of apical and a pair of lateral bristles slightly longer than those of mesoscutum. Abdomen broad in both sexes, as broad as, or slightly broader than, the thorax, suddenly narrowed at base; oblong and flattened in male, slightly arched in female, but also flattened and shortened-subrounded rapidly tapering apically. Male hypopygium rather small. Ovipositor three-jointed; the basal joint widened and flattened, about as long as basal width; second and third joints equal and twice as long as basal or nearly that, the second a little wider than thick, the third filiform needle-like, with microscopically sharply-pointed tip and evidently telescoping within second joint; whole ovipositor conspicuously longer than female abdomen, but about as long as abdomen of male. Legs short, normal in both sexes; the hind metatarsi a little elongate, middle and front ones successively less so; middle tibiæ with very weak short apical bristle. Auxiliary vein coalesced with first vein throughout, latter ending a little before small crossvein; apical cell not narrowed, second basal and anal cells distinct; hind crossvein about half way between small crossvein and point where

fourth vein reaches wing margin; a slight emargination of costa at end of first vein.

Type: *Acucula saltans*, n. sp.

*Acucula saltans*, n. sp.

Length of body of male, 5 mm.; body of female to end of extended ovipositor (axis of abdomen and ovipositor flexed to axis of thorax), 7 mm.; ovipositor, 3 mm.; wing, 4 to 4.5 mm.. Two males and one female reared from maggots found in cactus bloom at Santa Ana, Rio Rimac Valley, Peru, about 4,000 ft.

Wholly bluish-greenish black, polished, metallic; eyes, face and antennæ brown; face slightly cinerous in oblique lights; legs brown, tibiæ tawny or obscure yellowish. Wings clear, tawny whitish at base.

The eggs are evidently deposited within the cactus bud at a certain stage of development of the latter, the elongated needle-like ovipositor being used for piercing the wall of the bud. The maggots evidently feed on the fermenting juices of the flower mass, whose development is arrested by their presence.

This fly appears to be intermediate between the Milichiidæ and the *Sepsidæ*, partaking largely of the characters of both. The head, abdomen, wings, legs and vibrissæ are more like *Milichia;* while the frontal characters and larval habits are more like *Sepsis*. The larval saltatory habit finds its only known counterpart in *Piophila*. The fly is probably to be considered an aberrant member of the *Sepsidæ*, certainly so if the saltatory habit signifies anything.

## OVIPOSITION HABITS OF *CULEX ABOMINATOR* DYAR AND KNAB.

BY B. R. COAD, WASHINGTON, D.C.

To the best of the writer's knowledge, the oviposition habits of *Culex abominator* have not been published, and, as they are unique for a species of Culex, they are perhaps worthy of note.

The larvæ of this species are indigenous to the beds of aquatic vegetation which frequently form in the rivers and lakes of the north-central states. These beds are composed of Ceratophyllum, Potamogeton, Lemna and similar aquatic plants. This growth is more or less impervious to fish, but provides sufficient open water surface to allow the breeding of great numbers of mosquitoes.

The eggs of *abominator* are laid on the upper surface of Lemna fronds in rather large masses. In only one instance were the eggs found on any other plant, and in this case they were on the edge of a Potamogeton leaf which was floating on the water. They are quite firmly attached to the frond and to each other. The base of

FIG. 10.—Egg masses *Culex abominator*.

the egg is truncate, facilitating a firm attachment. The eggs are very black and the masses show up distinctly in contrast with the green of the frond. They are always near the margin of the frond and, upon hatching, the young larvæ immediately wriggle off into the water.

The usual appearance of the mass is shown in the accompanying photograph, thanks for which are due Mr. H. P. Wood.

The writer made these observations while working on the mosquitoes at Havana, Illinois, in the employ of Dr. S. A. Forbes, and this note is published with his kind permission.

# NOTES ON SOME COLEOPTERA OF THE OKANAGAN VALLEY.

BY E. P. VENABLES, VERNON, B.C.

In preparing the following list, I am fully aware that many of the observations and records may not be new. But as some years have been spent by the writer in collecting and recording, as opportunity has offered, insects of the Vernon district, there will no doubt be found among the species given some records of interest from the standpoint of geographical distribution. The Okanagan Valley, at Vernon, has an elevation of 1250 feet and it is at this point that all the material has been taken. Vernon is situated in what is known as the dry belt of B.C.

The summers are, as a rule, somewhat dry and irrigation is a necessity. During March and April there is, as a general rule, no rain to speak of beyond a few showers, and the months of May and June are what may be called in this district the wet months. From the middle of June to the middle of September the weather is very warm and bright. The snowfall begins at the end of November, and there is in most seasons a foot or more on the ground, which does not disappear until early in March.

The dates when given are those on the labels of the specimens and are not meant to show the period of activity of the species. This can, of course, only be done after many seasons of careful observation and accurate note-keeping.

I have not worked to any extent in the Carabidæ; hence the small number of species given. It is hoped to present lists of other families from time to time.

CICINDELIDÆ.

*Cicindela longilabris* Say.—IV. 04, V. 05, VIII. 08.

*purpurea* Oliv.—Rare, I. IV. 04.

*vulgaris* Say.—Very common in sandy places.

*oregona* Lec.—Another abundant species found on the shores of Long Lake.

*imperfecta* Lec.—Not commonly observed, V. 04.

CARABIDÆ.

*Cychrus marginatus* Fisch.—Found in rotten stumps, fairly numerous.

*angusticollis* Fisch.—Only one specimen.

*Carabus tædatus* Fab.—A common species to be found in the spring under dead leaves, etc.
*serratus* Say.—Numerous at all times.

*Calosoma calidum* Fab.—Very common.
*subæneum* Chd.

*Elaphrus riparius* Linn.—Taken in numbers on damp beaches, VIII.

*Opisthius richardsoni* Kby.—Taken under logs in August.

*Nebria gebleri* Dej.
*sahlbergi* Fisch.

*Bembidium bifossulatum* Lec.—III. 07; IV 06.
*planatum* Lec.—VIII. 05.

*Bembidium transversale* Dej.—Taken under leaves in spring.
*lucidum* Lec.—Numerous at all times in loose soil.
*pictum* Lec.—Fairly common.
*nigripes* Kirby.
4-*fossulatum* Mann.

*Patrobus longicornis* Say.—Taken under stones near water.

*Pterostichus validus* Dej.—Common under stones.
*riparius* Dej.—V.

*Amara latior* Kirby.—An abundant species during the whole year.
*californica* Dej.—Fairly common.

*Badister pulchellus* Lec.—Found under leaves in woods.

*Platynus cupripennis* Say.—Not common, taken in November and April.
*subsericeus* Lec.
*obsoletus* Say.
*sordens* Kirby.
*gemellus* Lec.

*Lebia virdis* Say.—Taken on low bushes in May.

*Cimindis planipennis* Lec.—Found under stones.

*Chlænius sericeus* Forst.—Under stones near water.
*pennsylvanicus* Say.—Taken in May and November.

*Harpalus computatus* Say.—Not numerous.
*fraternus* Lec.

*Stenolopus conjunctus* Say.—March and April.

*Tachycellus badiipennis* Hald.

## SOME BEES FROM NEW BRUNSWICK, WITH DESCRIPTION OF A NEW SPECIES OF *HERIADES*.

BY J. C. CRAWFORD, WASHINGTON, D.C.

While collecting Ichneumonoidea in New Brunswick, Mr. A. Gordon Leavitt also collected a number of other Hymenoptera, and below is given a report on most of the Apoidea. Some of the material, mostly Megachilinæ, Sphecodes and male Halictus, has not been identified, and is not included. A few of the determinations were made by Mr. H. L. Viereck, and credit is given in the proper places.

Owing to our scanty knowledge of the bees of Canada in general, the exact dates, sexes and number of individuals determined have been recorded.

*Bombus fervidus* Fabricus.

Nerepis, July 19, 22, two females; July 19, 22, 24, Aug. 22, five workers; Aug. 19, two males.

St. John, July 14, two females; July 14, 18, Sept. 23, three workers; Sept. 23, one male.

Red Head, St. John, Sept. 1, five workers, one male.

*Bombus ternarius* Say.

St. John, July 14, one female; Sept. 23, two workers; Aug. 19, Sept. 23, three males.

Nerepis, Aug. 18, 19, 22, Sept. 8, 9, twenty-seven workers.

Douglas Harbor, Grand Lake, Aug. 14, one worker.

Red Head, St. John, Sept. 1, one worker.

*Bombus terricola* Kirby.

St. John, Oct. 3, one female; July 14, one worker; Sept. 23, one male.

Nerepis, July 24, Aug. 18, 19, five workers; Aug. 18, one male.

Red Head, St. John, Sept. 1, one worker.

*Bombus vagans* Smith.

St. John, July 14, one female; Oct. 3, one worker; Sept. 23, to Oct. 3, three males

Nerepis, July 22, one female; Aug. 18, 19, Sept. 9, five workers; Sept. 8, one male.

*Psithyrus ashtoni* Cresson.

St. John, Oct. 2, one male.

Red Head, St. John, Sept. 1, one male.

*Psithyrus insularis* Smith.

St. John, Oct. 3, one female.

Nerepis, July 19, Sept. 8, two females.

Red Head, St. John, Sept. 1, one female.

*Psithyrus laboriosus* Fabricius.

Nerepis, Aug. 18, 19, Sept. 9, five males.

*Clisodon terminalis* Cresson.

Nerepis, Aug. 19, one female.

*Stelis foederalis* Cresson.

Nerepis, July 18, Aug. 18, two females.

*Macropis morsei* Robertson.

Nerepis, July 24, Aug. 19, six males; July 24, two females.

*Alcidamea producta* Cresson.

Nerepis, July 18, 22, two males; July 18, 24, Aug. 18, 20, 22, seven females.

*Heriades carinatum* Cresson.

Nerepis, Aug. 19, one male; Aug. 22, one female.

St. John, Sept. 9, one female.

*Heriades leavitti*, new species.

Male.—Length, about 5 mm. Black, with white pubescence, head and thorax closely and very coarsely punctured; face rugoso-punctate, the sides of face and clypeus almost concealed by the pubescence; second joint of antennæ subquadrate, the third, along its shortest side, not as long as broad; antennæ beneath dull reddish; wings brown; legs dark, obscurely reddish; abdomen coarsely and closely punctured, the punctures finer than those on thorax; the punctures on segments 1-3 hardly half a puncture width apart; segment four apically and 5 and 6 rugoso-punctured; 1st ventral segment elongate, medially at apex pointed, at base without a median elevation.

Habitat: Nerepis, New Brunswick.

Described from two specimens collected Aug. 22, by Mr. A. Gordon Leavitt, after whom it is named.

Type Cat. No. 16069 U. S. N. M.

This species resembles H. carinatum, but is smaller; lacks the projection at the base of the first ventral segment, has this sclerite elongate instead of short and truncate at apex medially, and has the first three dorsal abdominal segments more closely punctured, etc.

*Osmia atriventris* Cresson.

Nerepis, Aug. 18, 20, 22, seven females.

*Osmia melanotricha* Lovell & Cockerell.

Nerepis, Aug. 20, 22, four females.

As represented by this series, in this region the present species is larger than the preceding.

*Megachile infragilis* Cresson.

Nerepis, July 19, one female. Det. by Mr. Viereck.

*Megachile melanophæa* Smith.

Nerepis, July 19, 22, Aug. 18, 22, fifteen males. Det. by Mr. Viereck.

*Megachile vidua* Smith.

Nerepis, July 19, 22, Aug. 22, five females; July 22, one male.

St. John, July 14, four females; July 14, one male. Det. by Mr. Viereck.

*Perdita octomaculata* Say.

St. John, Sept. 9, one female.

*Panurginus asteris* Robertson.

St. John, Sept. 9, three males; Sept. 8, 9, ten females.

Nerepis, Aug. 18, 19, 22, twenty males; Aug. 18, Sept. 8, four females. Det. by Mr. Viereck.

*Calliopsis andreniformis* Smith.

Nerepis, Aug. 20, 22, four females; July 24, Aug. 20, 22, five males.

*Augochlora confusa* Robertson.

Nerepis, July 24, Aug. 19, two females; Aug. 22, one male.

St. John, Sept. 9, six females; Sept. 8, 9, four males.

*Halictus albipennis* Robertson.

St. John, Sept. 9, three females.

Nerepis, July 22, one female.

*Halictus arcuatus parisus* Lovell.

St. John, Sept. 8, two females; Sept. 8, 9, 18, twenty males.

Nerepis, Sept. 9, one female; Sept. 8, 9, six males.

*Halictus coriaceus* Smith.

St. John, Sept. 9, Oct. 3, two males.

Nerepis, Sept. 8, one female; Sept. 8, 9, four males.

*Halictus craterus* Lovell.

Nerepis, July 18, Aug. 18, 19, three females; Aug. 19, one male.

St. John, July 14, Sept. 8, 15, 18; Oct. 3, six females; Sept. 8, 9, 18, Oct. 2, 3, ten males.

*Halictus cressoni* Robertson.

St. John, Sept. 9, Oct. 3, two females; Sept. 9, one male.

Nerepis, July 18, one female.

*Halictus lerouxii* Lepelletier.

St. John, Sept. 8, Oct. 3, two males.

Nerepis, Aug. 18, one male

*Halictus oblongus* Lovell.

St. John, July 18, Sept. 8, 15, Oct. 3, six females.

Nerepis, July 22, Aug. 19, two females.

*Halictus pilosus leucocomus* Lovell.

St. John, Sept. 8, one female.

Nerepis, July 22, Aug. 19, two females; Aug. 18, three males.

*Halictus provancheri* Dalla Torre.

St. John, Sept. 8, 9, nineteen females; Sept. 8, 9, five males.

Nerepis, July 18, Aug. 18, three females; July 22, Aug. 18, 20, 22, ten males.

*Halictus versans* Lovell.

St. John, July 14, 18, seven females.

Nerepis, Aug. 19, one female.

*Andrena canadensis* Dalla Torre.

Nerepis, Sept. 8, 9, two females. Det. by Mr. Viereck.

*Andrena cratægi* Robertson.

Nerepis, July 22, 24, three females. Det. by Mr. Viereck.

*Prosopis basalis* Smith.

Nerepis, Aug. 18, one female.

*Prosopis cressoni* Cockerell.

St. John, Sept. 8, one male.

*Prosopis modestus* Say.

With yellow spots on collar: St. John, July 18, two males.

Nerepis, July 22, two males.

Without yellow on collar: St. John, July 14, 18, six males.

Nerepis, July 11, 22, 24, Aug. 18, nine males.

*Prosopis varifrons* Cresson.

St. John, July 18, two males.

Nerepis, Aug. 18, 19, two females.

*Prosopis ziziæ* Robertson.

Nerepis, July 22, Aug. 19, two males.

## THREE NEW NORTH AMERICAN DIPTERA.

BY J. R. MALLOCH, BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

*Chætoneurophora macateei*, new species.

Male: Black, shining, but not glossy. Palpi and legs more or less brownish. Halteres black.

Frons about one and two-thirds as wide as its length at centre; lower row of bristles convex; surface with numerous short hairs; antennæ normal; proboscis normal; palpi of moderate size, numerously bristled; one large downwardly directed bristle on posterior margin of cheek, besides the numerous smaller cheek bristles. Mesonotum with one pair of dorso-centrals; scutellum with four equal sized bristles. Second and fifth segments of abdomen elongated; hypopygium large, knob-like, anal protuberance slightly projecting, with several short bristles. Legs strong; fore tibia with one strong bristle at about middle, mid tibia with two at before basal third, one antero-dorsal and one almost dorsal, and one anterior bristle at near apex; hind tibia with one dorsal bristle at about one-third from base, one antero-dorsal at about same distance from base, and an antero-dorsal one at near to apex. Wings clear, veins yellowish; third vein bristled to fork; fork of third vein acute; first costal division equal to 2-3 together; fourth vein leaving at beyond fork of third with a decided curve.

Length, 4 mm.

Locality: Plummer's Island, Maryland, April 23, 1913 (A. K. Fisher), one specimen.

Near to *curvinervis* Becker, but differing in the bristling of the hind tibia and some minor particulars.

Female similar to male, except in form of abdomen. The sixth segment in this sex is distinctly the longest and the apex of abdomen is rather pointed. Same data as male.

This species is dedicated to W. L. Macatee of the Bureau of Biological Survey, in whose collection the types are.

*Botanobia* (=*Oscinis*) *varihalterata*, new species.

Female: Glossy black. Frons with triangle glossy, frontal stripe with a silky lustre, anterior margin obscurely brownish; antennæ reddish, third joint brown on upper surface; arista brown; face brown; cheeks glossy black-brown; proboscis brown, apical portion pale yellowish; palpi reddish. Thorax without any indication of dusting either on disk or pleuræ. Abdomen glossy black on dorsum, especially on apical half, venter opaque brown. Legs yellow, almost white, mid and hind femora except narrowly at bases, and basal third of hind tibiæ glossy black. Halteres pale yellow, with an elongate, glossy black streak on outer side of knob. Wings clear, veins brownish yellow. Hairs pale, bristles yellowish brown.

Frons slightly over one-third the width of head; triangle occupying two-thirds the width of vertex, and extending slightly over two-thirds to anterior margin of frons; surface hairs sparse and distinct; antennæ of moderate size, third joint rounded; arista pubescent, tapering, in length at least equal to width of frons; cheeks almost linear, especially at anterior margin; marginal hairs distinct, the upper strongest; proboscis and palpi normal; eyes distinctly higher than long, bare. Mesonotum without sulci, the hairs very closely placed and, though in rows, not easily distinguishable as such, the base of each hair in a very minute puncture; scutellum short, rounded in outline, the two apical bristles of good length, the two subapical bristles much shorter, disk haired as mesonotum. Legs normal; surfaces pale haired. Wings with third costal division three-fifths as long as second; veins 3-4 slightly divergent; penultimate sections of veins 3-4 subequal; outer cross vein at one and one-half times its own length from inner and two and one-half times its own length from end of fifth.

Length, 1.75 mm.

Type locality: District of Columbia, June 5, 1913 (J. D. Hood, and J R. Malloch).

Readily distinguished from any other previously described species by the peculiar mark on the haltere. In this respect the species resembles one in *Agromyza* which occurs in North America.

*Apocephalus antennata*, new species.

Female: Yellow, subshining. A small black spot on pleura

below wing base and another on the posterior surface of mid coxa. Posterior margin of abdominal segments narrowly browned; ovipositor glossy brown black.

Frons with two rows of four bristles and in front of those a single pair situated close together on middle of frons; lower pair of bristles, represented in *A. wheeleri* Brues, absent; third antennal joint very large, reaching as high as vertex, conical; arista brown, terminal, pubescent, slightly shorter than third antennal joint; palpi large, the surface bristles very minute. Mesopleura bare; mesonotum with one pair of dorso-centrals; scutellum with two marginal bristles. Second abdominal segment elongated, 2-3 bristles on lateral margins; sixth segment elongated and with a few short posterior hairs; ovipositor elongate-conical, four times as long as its basal width. Legs normal; hind tibia with 10-11 postero-dorsal setulæ. Wings with costa to middle; first division as long as 2+3; third about one-third as long as second; angle at fork of third vein obtuse; costal fringe twice as long as diameter of costal vein; fourth vein gently arcuated, leaving at fork of third, and ending distinctly in front of wing tip.

Length, 1.5 mm.

Locality: Plummer's Island, Maryland, June 8, 1913 (W. L. Macatee.)

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## CARNEGIE SCHOLARSHIP IN ENTOMOLOGY.

Mr. John D. Tothill, B. S. A., a graduate of the Ontario Agricultural College, Guelph, has been awarded the Carnegie Scholarship in Entomology in order to enable him to take a year's post graduate course at Cornell University. The value of the scholarship is $625.00 and includes travelling expenses. These scholarships are somewhat similar in character to the Rhodes scholarships at Oxford and are intended to enable qualified young men in various parts of the British Empire to spend a year in study at some University in the United States. Mr. Tothill is a field agent of the Division of Entomology at Ottawa, and is at present carrying on investigations under the direction of Dr. Hewitt, in the work of parasites of the Brown-Tailed Moth in N. B., his headquarters being at Fredericton.

# A SECOND NEW GENUS OF CHALCIDOID HYMENOPTERA OF THE FAMILY MYMARIDÆ FROM AUSTRALIA.

BY A. A. GIRAULT, NELSON (CAIRNS) QUEENSLAND.

The following genus has the general appearance of certain Entedoninæ and resembles also species of *Gonatocerus*, but it is very small. It is allied with *Gonatocerus*. Its many-jointed antennæ are unique for the family.

*Agonatocerus*, new genus.

Normal position.

Female: Like *Gonatocerus* Nees, but the antennæ 13-jointed, the body much smaller. Proximal four funicle joints small, subequal, the distal six subequal, each over four times longer than any ot the proximal four, subequal in length to the pedicel. Fore wings with short marginal fringes. Club solid, not long. Abdomen subsessile, the phragma absent. Scutum with a median grooved line.

Male: Not known.

Type: *A. humboldti*, described herewith.

1. *Agonatocerus humboldti*, new species.

Female: Length, 0.65 mm.

Dusky brown, the base of the abdomen golden yellow, the wings hyaline. Antennæ and legs somewhat darker, dusky, the proximal half of the scape pallid. Fore wings without discal cilia under the venation or for some distance beyond, distad bearing about eighteen lines. Mid-longitudinal line of posterior wing without discal cilia.

(From one specimen, two-third-inch objective, one-inch optic, Bausch and Lomb.)

Male: Not known.

Described from a single female captured in the first week of December, 1912, by Mr. Alan P. Dodd by sweeping in a forest.

Habitat: Australia—Nelson(Cairns), Queensland.

Type: In the Queensland Museum, Brisbane, the above specimen in xylol-balsam.

Respectfully dedicated to Alexander von Humboldt.

Mailed August 5th, 1913

The Canadian Entomologist.

Vol. XLV. LONDON, SEPTEMBER, 1913 No. 9

# MUTUAL ADAPTATION OF THE SEXES IN *ARGIA MOESTA PUTRIDA*.

BY E. M. WALKER, TORONTO.

On August 1st, 1912, I captured a pair of *Argia moesta putrida* at Go Home Bay, Ont., and by killing them suddenly with gasoline, prevented the separation of the abdominal appendages of the male from the parts of the female with which they were in contact. I noted carefully the relations of the structures forming the connection, but unfortunately made no drawings at the time, as the specimens remained in their natural position after drying and the connection was apparently permanent. In carrying the specimens to Toronto, however, they separated, so that I have had to rely upon my original observations and a close scrutiny of the structures concerned in my further study of the method by which coupling in this species is effected. Some difficulties as to the precise position of the inferior appendages of the male in relation to the pronotum of the female were readily solved by making plasticine models of the parts of both sexes and fitting them together.

The only published account of the process of coupling in the genus Argia is given by E. B. Williamson in an article entitled "Copulation in Odonata."* In this paper a classification of the methods of coupling in a number of zygopterous genera is given, and the following extract gives all that is known in regard to this process in the genus Argia, the observations having been made upontwo species—A. moesta putrida and A. apicalis.

> "BB. Inferior appendages forming two jaws which grasp the anterior surface of the hind lobe of the pronotum of the female, the superior appendages resting in cups formed by depressions in the mesostigmal laminæ and the rear surface of the hind lobe of the pronotum and, depending on their

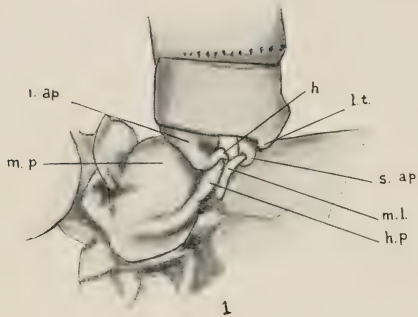
*Ent. News, XIII., pp. 143-148, 1906.

form, grasping the mesostigmal laminal or not. The female, by drawing the hind lobe of the pronotum closely against the mesostigmal laminal, prevents the escape of the male.

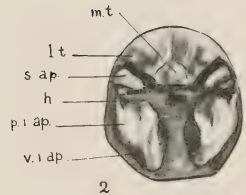
D. Dorsum of apex of segment 10 of male modified to form a brace against the middorsal carina or its fork or the cavity in the fork. *Anomalagrion*, *Ischnura*, *Enallagma*.

DD. Dorsum of apex of segment 10 of male with a viscid pruinose tubercle on either side which attaches itself to the mesoepisternum of the female on either side of the fork of the middorsal carina, the tubercle which corresponds to the inferior appendage of Anisoptera engaging the cavity in the fork between the mesostigmal laminæ. *Argia* (*putrida* and *apicalis*)."

In my specimens the inferior appendages of the male were in contact with the dorsum of the pronotum of the female in the position shown in fig. 1. The posterior prominence of the inferior appendages fits into the depression between the middle and hind lobes of the pronotum, which is deepened on each side to receive it (figs. 3 and 4). Thus the posterior surface of the inferior appendages (p. i. ap.) is applied to the anterior surface of the hind lobe of the pronotum of the female and the postero-ventral surface of the appendages (v. i. ap.) rests upon the postero-dorsal surface of the middle lobe of the pronotum. The upper and outer angle of each inferior appendage bears a small slightly hooked process (n), which clasps the posterior margin of the hind lobe of the pronotum. The superior appendages do not "rest in caps formed by depressions in the mesostigmal laminæ, etc." but the reverse is the case. The "ear" of each mesostigmal lamina is received into the concavity of the corresponding male superior appendage (figs. 1 and 4), which apparently rests in the pit on the mesoepisternum just beneath the former. The mesoepisternal tubercles of the female, which are but slightly developed in this species, do not seem to play an important part in this process, except perhaps in forming the outer boundary of the pit just referred to. I have not actually




1

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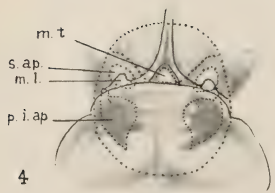


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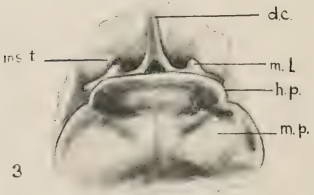


3

ARGIA MOESTA PUTRIDA (ODONATA).

verified the statements made by Williamson in Section DD of his analysis, but, in fitting my model together, I found that the parts mentioned by him here must necessarily be related in exactly the manner described.

As stated by Williamson in Section BB, "The female, by drawing the hind lobe of the pronotum against the mesostigmal laminæ, prevents the escape of the male." In the case of Argia moesta putrida, the result of this action is that the two pairs of appendages of the male are drawn together and it can readily be seen by examining the figures that in such a position these appendages are incapable of being shifted in any direction, and hence escape of the male is impossible unless permitted by the female.

The mutual adaptation of these structures in the two sexes is so precise that it seems improbable that copulation could take place between different species of Argia, even though very closely related.

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## Explanation of Plate VIII.

Fig.1.—Position of the abdominal appendages of the male in relation to the thorax of the female in copulation.

Fig. 2.—Posterior view of end of male abdomen.

Fig. 3.—Dorsal view of parts of the pronotum and mesoepisternum of the female.

Fig. 4.—Semi-diagrammatic combination of figures 2 and 3, showing the relative positions of the parts in coupling. The parts of the male are indicated by dotted lines.

S. ap., superior appendage of male; i. ap., inferior appendage of male; p. i. ap., posterior surface of same; v. i. ap., postero-ventral surface of same; h. terminal hook of same; m. t., tubercle which engages the cavity between the forks of the dorsal thoracic carina; v. t., viscid lateral tubercle; m. p., middle lobe of pronotum of female; h. p., hind lobe of pronotum of female; d. c., middorsal thoracic carina; ms. l., mesostigmal lamina of female; ms. t., meso-epistemal tubercle of female.

## A NEW SPECIES OF NEUROTERUS FROM WASHINGTON.

BY WILLIAM BEUTENMULLER, NEW YORK.

*Neuroterus washingtonensis*, sp. nov.

*Male.*—Head black, mouth parts pitchy brown; front shining and indistinctly rugose; eyes very large and conspicuously reticulated. Antennæ 14-jointed, basal joints pale yellowish brown, terminal joints darker. Thorax dark brown, with the whole surface finely crackled and with minute whitish hairs; parapsidal grooves very fine and line-like and extending to beyond the middle; median line also fine and almost reaching the scutellum. All the lines may be seen by transmitted light; sides of thorax yellowish brown. Scutellum blackish brown, large, rounded and obtusely pointed at the apex; it is more distinctly crackled than the thorax, with a fine transverse line at base, and covered with a few scattered whitish hairs. Abdomen small, smooth and shining; petiole long and yellowish brown. Legs pale yellowish brown. Wings hyaline; veins brown, radial area closed; cubitus not extending to the first cross-vein; arcolet large and triangular; anal vein broken. Length, 1.75 to 2 mm.

*Female.*—Wholly black, abdomen robust and large, petiole very short. Antennæ darker and shorter than the male, 13-jointed. Legs shorter and stouter than those of the male, yellowish-brown, with all the femora dark brown to nearly the tip. Ovipositor very long.

Length: 1.50–2 mm.

*Gall*: On the leaves of white oak (*Quercus garryana*), singly or in numbers on the mid-rib and principal veins, sometimes deforming the entire leaf. Rounded, irregularly rounded, oval or elongate and often forming a shapeless mass when confluent. Green and fleshy when fresh; brown, hard and woody when old and dry. Inside it is solid, whitish and filled with numerous larval cells.

Length, 10–35 mm. Width, 10–15 mm.

*Habitat*: Friday Harbor, Puget Sound, Washington. Galls, July 2nd, 1911. Flies, July 30th, 1911. Lewis H. Weld, collector.

The species is allied to *Neuroterus batatus* and *N. noxiosus*, and it is probably double brooded like these two species. The gall somewhat resembles that of *N. noxiosus*. Hundreds of specimens

NEUROTERUS WASHINGTONENSIS (BEUTENMULLER).

of *N. washingtonensis* were bred from the galls by Mr. Weld, and they are all essentially the same as color, form and sculpture. The types are in my collection and paratypes were deposited with Mr. Weld, and the following institutions: United States National Museum, Museum Comparative Zoology, American Entomological Society, Cornell University and British Museum.

## EXPLANATION OF PLATE IX.

Figs. 1, 2, 3.—Galls, natural size.
Fig. 4.—Wings, greatly enlarged.
Fig. 5.—Antennæ of male, greatly enlarged.
Fig. 6.—Antennæ of female, greatly enlarged.
Fig. 7.—Anterior leg, greatly enlarged.
Fig. 8.—Posterior leg, greatly enlarged.
Fig. 9.—Ovipositor of female, greatly enlarged.

Figures 1–3 were made by Mrs. E. L. Beutenmuller, and figures 4–9 by Mr. Lewis H. Weld.

## NEW NORTH AMERICAN DIPTERA.

BY J. R. MALLOCH, WASHINGTON, D.C.

The two species of Chloropidæ described herewith I had purposed including in a larger paper dealing with the whole genus to which they belong, but the carrying out of this project is at present not possible, and I thus present them in their present form pending the possible completion of my work on the different genera of Chloropidæ at some future time. The species of *Milichiella* I took after my paper dealing with the Agromyzidæ had gone to the press. The characters given in the description should readily separate it from any described American species of this genus.

*Madiza* (=*Siphonella*) *nigripalpis*, new species.

*Male and Female:* Glossy black. Antennæ sometimes brownish on the inner surface of third joint; palpi generally black, but sometimes brown. Legs black; fore tibiæ entirely, and apical third of mid and hind tibiæ as well as entire tarsi on all legs, except apical joint, clear yellow. Halteres whitish. Wings clear, veins yellow.

Frons about one-third wider than either eye, whole surface glossy; triangle poorly defined, occupying more than two-thirds the width of vertex and reaching slightly over midway to anterior margin of frons; surface hairs on frons weak, those on triangle confined to margins; antennæ of moderate size, third joint rounded; arista short, not as long as width of frons, basal joints elongated and slightly swollen, pubescence indistinct; face concave; cheek distinctly higher than width of third antennal joint, the anterior angle produced slightly; lower half of cheek bristled, the usual strong hair at anterior angle; eye pubescent, distinctly higher than long. Mesonotum thickly covered with short, pale hairs, at the base of each of which there is a small puncture; there are traces of a central line of punctures, and, more distinctly, of two lateral, broader lines; scutellum with disk haired as of disk of mesonotum, rounded in outline; two apical marginal bristles and two weaker bristles anterior to them, at the base of each of the long bristles there is a slight tubercule. Wings with third costal division distinctly more than half as long as second; veins 3–4 slightly divergent at apices; outer cross vein oblique.

Length, 1.5 mm.

Type in author's collection.

Locality: Beltsville, Maryland, swept in hay field, June 15, 1913 (J. R. Malloch, J. D. Hood).

*Madiza* (=*Siphonella*) *projecta*, new species.

*Female*: Yellow, slightly shining. Ocellar spot black; proboscis glossy brown at joint. Mesonotum with three black-brown stripes, which are not clearly defined and sometimes indistinct, the side stripes generally shortened posteriorly; pleuræ with a dark, brownish spot on the middle; scutellum sometimes with a discal brown spot. Abdomen with three longitudinal rows of brown spots, or with fore margins of segments brownish. Legs entirely yellow, or with the femora slightly darkened at middle, and the bases of hind tibiæ darkened. Wings clear. Halteres yellow.

Head in profile distinctly produced at mouth margin; frons about one-half the head width, surface hairs pale; proboscis very long, either half as high as head; arista bare, short, not as long as breadth of frons; cheek as high as breadth of third antennal joint;

eyes pubescent. Mesonotum with a more or less distinct central line of punctures and the disk covered with short pale hairs; scutellum rounded, four distinct marginal bristles present, the disk with short hairs. Legs normal. Wings with third costal division two-thirds as long as second; veins 3–4 subparallel; outer cross vein slightly oblique; last section of fifth vein nearly twice as long as penultimate section of fourth.

Length, 1-5 mm.

Type: Cat. No. 16002, U.S.N.M.

Locality: Las Cruces, New Mexico, May 20, 1896, on *Yucca angustifolia* (T. D. A. Cockerell).

Paratypes: Same data, and one specimen, Mesilla Park, May 7 (T. D. A. Cockerell). Five specimens.

*Milichiella urbana*, new species.

*Female*: Black-brown, slightly shining. Mesonotum opaque brown. Abdomen slightly shining and almost black in color. Legs with tarsi brownish, the remainder black. Wings clear, veins brown. Halteres brown.

Frons at least one-half the head width, opaque, orbits very narrow, grayish pollinose, bristles distinct, and extending to the base of antennæ; center rows slightly divergent towards ocelli; antennæ of normal size; arista slightly pubescent, hairlike, a little longer than length of frons; three bristles above level of mouth; cheek linear, marginal bristles distinct; palpi and proboscis normal; incision on posterior eye margin distinct. Mesonotum with disk covered with short black setulæ and with one pair of prescutellar dorso-centrals; scutellar bristles subequal. Abdominal segments with short discal hairs, apex of last segment setulose. Legs without bristles, their surfaces with short hairs. Wings with veins 2-3 slightly divergent at apices, veins 3-4 slightly convergent at apices; last section of fifth vein slightly longer than penultimate section of fourth.

Length, 1.25 mm.

Type in author's collection.

Locality: Washington, District of Columbia, June 23, 1913, at an open window in center of city (J. R. Malloch).

# REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (TIPULIDÆ), WITH A KEY TO THE SPECIES OF PTYCHOPTERA.

BY CHARLES P. ALEXANDER, ITHACA, N.Y.

(Continued from Page 210.)

*Gonomyia (Gonomyia) superba*, sp. n.

Antennæ, brown; color, brown and yellow; vein, *Sc* ends slightly beyond the origin of *Rs*.

*Male.*—Length, 5–5.5 mm.; wing, 4.9 mm.

*Female.*—Length, 5.9 mm; wing, 5.2–5.5 mm.

*Male.*—Rostrum yellow, palpi brown; antennæ brown, including the basal segments; front, vertex and occiput dull yellow, the vertex clearer yellow behind.

Pronotum, clear light yellow above; on the sides, a short, dull brown stripe from the cervical sclerites down to above the fore coxa. Mesonotum, præscutum very light yellowish brown, with rich chestnut-brown stripes, a median stripe, broad and dark in front, narrow behind, and again enlarged at its end divided by a pale, narrow, median stripe; lateral stripes short, beginning behind the pseudosutural pits crossing the transverse suture and suffusing the lobes of the scutum; lateral edge of the præscutum, in front, yellowish; behind, brown; scutellum pale, whitish; the base and lateral edges tinged with brownish, post notum brown. Pleuræ clear yellowish white, an irregular dark brown mark behind and above the base of the coxa; sternum yellow, the sides of the mesosternum, between the fore and middle legs, brown, separated by a broad median pale mark; the propleural stripe begins on the prosternum as a rounded mark which sends out a narrow caudal prolongation. Halteres light yellow. Legs: coxæ and trochanters light yellow, margins of the segments more or less brown; femora and tibiæ light brown; tarsi somewhat darker brown. Wings, hyaline or nearly so; veins brown, costa more yellowish. Venation (see fig. 14, pl. III): Sc ending slightly beyond the origin of Rs; basal deflection of $Cu^1$ about at the fork of M.

Abdomen, tergum, light yellow, each segment with a large brown mark on basal half, the caudal margin of this mark much

rounded; sternum light yellow. Hypopygium (see fig. 1 and 2, plate X). Pleurites short and broad, the caudal end produced into one fleshy and three chitinized appendages, as follows: Viewed from above, a fleshy lobe in front, the inner dorsal margin produced entad and dorsad into a slightly curved slender spine; behind the fleshy lobe arises a stout hook, very strong at the base, constricted before the middle, the tip slender and pointed, this hook directed entad and caudad; from the outer ventral angle of the pleurite arises a long, straight chitinized appendage, directed entad and caudad, narrow basally and more enlarged apically. The guard of the penis is long, pale, ending in a long, slender, tube-like point. On either side of the penis guard arises an elongate, very slender, chitinized hook, which is straight for about three-fifths its length and then bent strongly inward; viewed from the side, these hoops are bent very strongly ventrad and then caudad. Summarized, the hypopygium bears eight chitinized slender arms, all except two (which are probably homologous with the second gonapophyses) being borne by the pleurites.

*Female.*—Very similar to the male, but larger.

Vial No. 1.—Tokio, Japan; Aug. 1912. One ♂.

Vial No. 5.—Nishigahara, Japan; Apr. 25, 1912; 5 ♂, 4 ♀.

Holotype, ♂; Vial No. 1.

Allotype, ♀; Vial No. 5.

Paratypes, 5 ♂, 3 ♀; Vial No. 5.

Types in author's collection; Paratypes in U.S. National Museum and Cornell University Collections.

*G. superba* differs from *nubeculosa* Meij. (Java). (Tijd. voor Entomol., vol. 44, p. 48, 49; fig. 36, 1911) in the unspotted wings; from *metatarsata*, (l.c., p. 48, fig. 35) in its closed cell 1st $M_2$, etc.

*Gonomyia* (*Leiponeura*) *insulensis*, sp. n.

Pleuræ without longitudinal stripes; vein *Sc* ends far before the origin of *Rs*.

*Female.*—Length, 3.9–4 mm.; abdomen, 2.6 mm.; wing, 4 mm.

Female.—Rostrum yellow, palpi brown; antennæ, segment one yellowish, remainder dark brown; front, vertex and occiput yellow, the vertex suffused with dark colored.

Mesonotal præscutum yellowish, with three brown stripes, the median one broad, not divided by a pale median vitta, extending to the suture, the lateral stripes are broad, narrow, uniform in width until they cross the suture (not expanded behind), lateral margin of the sclerite dull yellow, the ground color between the brown stripes is very reduced; scutum, lobes dark brown, median line yellowish; scutellum yellow, a brown median spot in front; postnotum brown. Pleuræ, mesopleuræ brown in front, extending from the lateral margin of the præscutum down to and suffusing the mesosternum on the sides; metasternum pale brown. Halteres dull yellow. Legs: coxæ and trochanters yellow, suffused with brown in front; femora, tibiæ and tarsi brown, a little darker toward the tip. Wings subhyaline, veins brown. Venation (see fig. 12, plate III); Sc. ending far before the origin of Rs; $R^{2+3}$ almost parallel to $R^1$.

Abdominal tergites yellowish-brown; sternites light yellow.

Vial No. F.—Tokio, Japan; August, 1912; 1 ♀.

Holotype, ♀; in Vial F.

Type in author's collection.

The three species of *Gonomyia* described by de Meijere as *Atarbæ* (Tijd. voor Entomol.; vol. 44, 1911) are all members of the subgenus *Leiponeura* Skuse. These species are *Gonomyia nebulosa* (l.c., p. 42, fig. 25); *pilifera* (l.c.; p. 43, fig. 26) and *diffusa* (l.c.; p. 43, 44). They have nothing in common with *Atarba* and are quite distinct from any members of the *Leiponeura* group, that I know of, in their clouded wings. *G. insulensis* differs from all of the above species in its unmarked wings.

*Genus Erioptera* Meigen.,
*Subgenus Acyphona* Osten-Sacken.

Of this subgenus, two species were included, both of which are herein characterized as new. The only described Palæarctic species, *Acyphona maculata* Meigen, of Europe, differs from the Japanese species, as follows: Wing pattern, in *maculata* large, rounded brown markings mostly with grey centers; the body-shade is much lighter in *maculata* and there are several important differences in hypopygial characters, these being shown by the following key:

1. 9th tergite broad and thin, at its apex deeply notched; two chitinized teeth at the base of the pleura on the ventral side.....2.

   9th tergite provided with two chitinized hooks at its apex; no chitinized teeth at the base of the pleura on the ventral side; [horns of the second gonapophyses long, widely separated at the base] (Japan).....*asymmetrica*, sp. n.

2. Base of pleura on sternal side provided with a chitinized plate which is bidentate, the proximal tooth free, the distal one joined to the pleura; 2nd gonapophyses short, chitinized at tip and on sides; apex merely notched. (Europe).....*maculata* Meigen.

   Base of pleura on sternal side provided with a small chitinized tooth, minutely denticulate; 2nd gonapophyses long, the tips long and widely separated (Japan).....*incongruens*, sp. n.

*Erioptera* (*Acyphona*) *incongruens*, sp. n.

Small species; light brown, with narrow dark brown pleural stripes; wings thickly spotted with brown.

*Male.*—Length, 5 mm.

*Male.*—Rostrum and palpi brown. Antennæ long, segment one brownish-yellow; segments two to eight light yellow; remainder with increasing amounts of brown at their tips, the apical segments all brownish. Front, vertex and occiput dark brown.

Thoracic pronotum brownish-yellow, brown on the sides. Præscutum reddish-brown, with a double median brown stripe; humeral region brighter yellow; sides of the sclerite darkened; scutum, scutellum and postnotum brown. Pleuræ reddish-brown with narrow dark-brown lines, the most dorsal one continuing from behind the fore coxa underneath the wing to the postnotum; the second beginning on the mesosternum running above the middle coxa, becoming very narrow and indistinct before the root of the halter; the last stripe on the metasternum over the hind coxa. Halteres light yellow. Legs: coxa brown; trochanters brownish-yellow. (The legs are all detached and loose in the vials; most of these have the femora largely brown, basal third mostly paler, yellowish; a post median yellow ring, tip usually pale; tibiæ and

tarsi clear light yellow, sometimes infuscated at the tips; tibiæ often with a sub-basal annulus. In the vial were several specimens of *E. asymmetrica*, a closely allied form, and most of the legs evidently belong to that species. Two legs in the vial are very different and may belong to this little species, this being rendered probable by the size; in these the entire legs are clear, light yellow, the femora with a rather narrow subapical dark brown ring).

Wings spotted with brown.

Abdomen: Tergum dull brownish yellow, apex and lateral margins of the sclerites brown. Hypopygium unsymmetrical as in the genus, the 9th abdominal segment being twisted one-half around. Suture between the 9th tergite and the 9th sternite not indicated. The 9th tergite is broad and long, its hind margin produced caudad in a wide, thin plate which is broadly and rather deeply notched at its middle; no chitinized hooks at its apex. The pleurites are convex outerly (produced into two apical appendages), the base (dorsal) produced entad and cephalad in a long, chitinized hook; the ventral edge of the pleura near the sternum possesses a small chitinized organ which is directed caudad and is provided with two or three denticulæ; of the two apical appendages, the ventral one is chitinized, the dorsal one is fleshy, the second gonapophyses are close together, the chitinized tips rather long and deeply divided. (See plate X, figs. 5 and 6).

Holotype, ♂. Vial 6, April 25, 1912; Tokio, Japan.

*Erioptera* (*Acyphona*) *asymmetrica*, sp. n.

Resembles *incongruens* closely, but is larger, the coloration darker, especially on the pleuræ and usually on the abdomen. Wings hyaline, spotted with brown, varying considerably in the intensity and size of the markings; in some the dots are small, not confluent, in the darker specimens the spots on the costal half of the wing tend to flow together to form large blotches. The male genitalia of the two species is remarkably different. (See plate III, fig. 15, wing.)

The hypopygium is, as in the genus, asymmetrical, the usual dorsal portions of the 9th sclerites being switched around on a level with the pleural sutures of the remaining segments. (See fig. 7–9, plate X), suture between 9th tergite and sternite obliterated, 9th

tergite broad and long with a cross-shaped mark; near its tip set with two small, semicircular, chitinized pieces which are produced into sharp points on the proximal ends. Pleurites short and stout, at the base on the dorsal side, produced into a long, slender, chitinized arm which is directed entad, two apical appendages, the more ventrad being chitinized, especially at the tips, the dorsal apical appendage fleshy. Between the tergite and the unarmed sternite, nearly in the median plate, is a rectangular, subchitinized organ, bearing at its outer angles chitinized hooks, bent ventrad and inward, these hooks minutely denticulated at tip.

♂.—Length, 5.8 mm.; wing, 6.3 mm.

♀.—Length, 6.4–7.1 mm.

Holotype.—Vial 6, April 25, 1912; Tokio, Japan.

Allotype.—Vial 6, April 25, 1912; Tokio, Japan.

Paratypes.—Vial 6 and L; 4 ♀, 2 ♂, April 25, 1912; Aug. 1912, Tokio, Japan.

*Subgenus Erioptera*, Meigen.

*Erioptera* (*Erioptera*) *elegantula*, sp. n.

Wings with brown spots.

*Male.*—Length, 5.4 mm.; wing, 7.7–7.9 mm.

*Female.*—Length, 6–6.5 mm.; wing, 7–8.3 mm.

*Male.*—Rostrum and palpi dark brown, antennæ with basal segments brown, flagellar segments short, dark brown; front, vertex and occiput dark brown.

Pronotum dark brown above, lighter colored on the sides. Mesonotum dark brown, the region before the pseudosutural pits more yellowish; scutum, scutellum and postnotum dark brown. Pleuræ dark brown. Halteres pale. Legs: coxæ dark brown; trochanters brown; femora dark brown; tibiæ dark brown, a little paler at the extreme base; tarsi dark brown. Wings subhyaline with greyish-brown marks, as follows: A large rounded spot at origin of Rs, a second at $Sc^2$, a third at end of $Sc^1$ running down over cross-vein r; a fourth spot at tip of $R^1$ and a smaller one at tip of $R^2$; cord broadly margined with the same color; less distinct clouds at ends of the other veins and along most of these veins. Venation, (see fig. 3, plate III.)

Abdomen dark brown, densely clothed with long whitish hairs. Hypopygium. 9th tergite broad at base, narrowed at the middle,

the tip rather expanded with a deep V-shaped incision, the lobes rounded. Pleurites long, cylindrical, not very convex on outer face; three apical appendages, the more dorsal being somewhat fleshy, brown, elongate-cylindrical, narrowed basally, provided with long hairs, and, at its tip, with a slender hook directed cephalad; the median apical appendage is longest, chitinized,very strongly so at its tip; tip broadly expanded and concave, this concavity provided with minute denticulæ; the ventral apical appendage is shorter than the median one, fleshy, cylindrical, narrowed at base. Viewed from beneath, the 9th sternite is straight on its caudal margin, pleurites very broad at base, produced entad and almost meeting on the median line on the sternum; second gonapophyses long, slender, acicular, the tips barely projecting beyond the caudal level of the 9th sternite.

*Female.*—Similar, but averages larger in size.

Vial No. 1.—Tokio, Japan; 2 ♂, 2 ♀.

Vial No. 16.—Tokio, Japan; 2 ♀ (small, but apparently of the same species.)

Holotype.—♂. Vial No. 1, I.

Allotype.—♀. Vial No. I.

Paratypes.—1 ♂, 3 ♀, Vials I and 16.

Types in author's collection.

*E. elegantula* differs from *E. javensis* Meij. (Tijd voor Entomol., vol. 44, p. 45, 46, fig. 28, 1911) and *E. notata* Meij. (l.c., p. 46, figs. 29–31) in its spotted wings.

*Genus Molophilus* Curtis.

*Molophilus pegasus*, sp. n.

Antennæ of the male short; color of body brown.

*Male.*—Length, 4.2 mm.; wing, 4.3 mm.

*Female.*—Length, 4.9 mm.; wing, 5.1 mm.

*Male.*—Rostrum and palpi dark brown; antennæ light yellow, the flagellar segments with the exception of the first, a little more brownish; antennæ short, extending about to the base of the wings, segments of flagellum cylindrical; front, vertex and occiput brown.

Pronotum above, light yellow, darker on the sides. Mesonotal præscutum reddish-brown, with a broad, dark brown median stripe, and less distinct but broader lateral stripes, which begin

behind the pseudosuture, broaden out behind and fuse with the median stripe near the transverse suture; scutum, lobes brown, median line paler; scutellum lighter colored, yellowish medially, brown on the sides; postnotum brown. Pleuræ brown except dorsally, where there is a pale band running from the pronotum back to the wing basis. Halteres light yellow. Legs: coxæ and trochanters pale yellow, femora short, incrassated beyond the base, brown, paler basally; tibiæ and tarsi brown. Wings slightly tinged with yellowish-grey; veins yellow. Venation (see fig. 11, plate III).

Abdomen, tergites dark brown; sternites rather lighter brown, extreme apices of the sclerites pale. Hypopygium (see figs. 3 and 4, plate X); 9th tergite and sternite completely fused so that no pleural suture remains; viewed from beneath, the 9th sternite projects backward, its caudal margin rather squarely truncated; the outer ventral pleural arm is straight, fleshy, rather thickly covered with long hairs; just entad of the outer arm and nearer to the base of the pleurite, arises the inner ventral pleural arm, which is elongate, slender, its tip strongly chitinized and denticulated at the extreme end and bent inward; the guard of the penis is a pointed, chitinized organ, nearly as long as the outer pleural arm. Viewed from the side, outer ventral arm of the pleurite directed caudad; inner ventral arm with the tips conspicuously arcuated and bent ventrad; just above the base of the inner arm arises the dorsal pleural appendage, very broad at the base, its tip chitinized and directed slightly dorsad, on the dorsum of the pleurite are two protuberences clothed with long hairs. Viewed from above, the pleurites are very broad, so that the space between them on the median line is narrow; about midway of their length, on the inner face, is a strong protuberance, directed inward; it is strongly chitinized and almost touches its mate of the opposite side.

*Female.*—Similar, but larger; the abdomen is dark brown, the genital segment much brighter, yellowish-brown.

Vial No. 19.—Tokio, Japan; June 25, 1912; 1 ♀.
Vial No. 20.—Tokio, Japan; June 25, 1912; 1 ♀.
Vial No. K.—Tokio, Japan; Aug. 1912; 1 ♂.
Holotype.—1 ♂, Vial K.
Allotype.—1 ♀, Vial 20.
Paratype.—1 ♀ Vial 19.

Types in author's collection; paratype in U.S. National Museum collection.

*M. pegasus* differs from *bicolor* Meij. (Java) (Tijd. voor Entomol.; vol. 44, p. 45, fig. 27) in its darker brown body-color and darker legs.

*Genus Conosia Van der Wulp.*

*Conosia irrorata* Wiedmann.

The following papers since Kertesz (1902) may be cited:

1904.—*Conosia irrorata* de Meij; Bijdragen tot de Dierkunde; p. 92.

1911.—*Conosia irrorata* de Meij; Tijdschrift voor Entomologic; vol. 44, p. 51.

1911.—*Conosia irrorata* Brun.; Rec. Indian Museum; vol. 6, part. 5, p. 283.

1912.—*Conosia irrorata* Brun.; Fauna Brit. India, Dipt. Nemat., p. 497.

One female in vial 47; Tokio, Japan. The wing pattern is figured on pl. III; fig. 13.

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## Explanation of Plate X.

Fig. 1.—Hypopygium of *gonomyia superba;* dorsal aspect; x, y, z = chitinized pleural appendages.

Fig. 2.—Hypopygium of *gonomyia superba;* lateral aspect, sternum uppermost; lettering as in fig. 1.

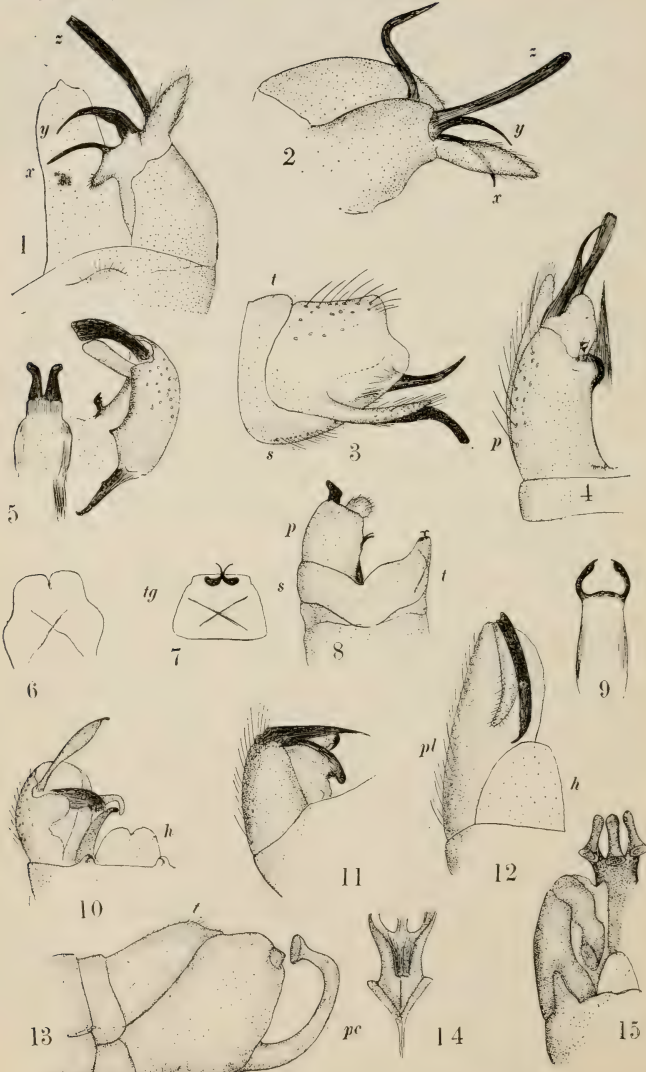
Fig. 3.—Hypopygium of *Molophilus pegasus;* lateral aspect; t = 9th tergite; s = 9th sternite.

Fig. 4.—Hypopygium of *Molophilus pegasus;* dorsal aspect; p = pleura.

Fig. 5.—Hypopygium of *Erioptera* (*Acyphona*) *incongruens,* sp. n.; dorsal aspect.

Fig. 6.—Hypopygium of *Erioptera* (*Acyphona*) *incongruens;* 9th tergite, dorsal aspect.

Fig. 7.—Hypopygium of *Erioptera* (*Acyphona*) *asymmetrica;* 9th tergite, dorsal aspect.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EXPLANATION OF PLATE X.—Continued.

Fig. 8.—Hypopygium of *Erioptera (Acyphona) asymmetrica;* lateral aspect; p = pleura; s = 9th sternite; t = 9th tergite.

Fig. 9.—Hypopygium of *Erioptera (Acyphona) asymmetrica;* dorsal aspect; gonapophyse.

Fig. 10.—Hypopygium of *Limnophila japonica;* dorsal aspect; h = anal tube.

Fig. 11.—Hypopygium of *Limnophila satsuma ;* ventral aspect.

Fig. 12.—Hypopygium of *Limnophila inconcussa;* dorsal aspect; h = anal tube; pl = pleura.

Fig. 13.—Hypopygium of *Liogma kuwanai;* lateral aspect; t = 9th tergite; pc = penis-guard.

Fig. 14.—Hypopygium of *Liogma kuwanai;* ventral aspect of the base of the tripartite penis-guard.

Fig. 15.—Hypopygium of *Liogma kuwanai,;* dorsal aspect.

(TO BE CONTINUED.)

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## A NEW PYROMORPHID FROM TEXAS.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

*Acoloithus novaricus*, sp. nov.

Very similar to *falsarius* Clem., having the wings of the same dull black colour. The distinguishing feature is that the collar is unbroken reddish-orange, whereas in *falsarius* this colour is confined to the lateral areas, the centro-dorsal portion being black. Expanse, 14 mm.

*Habitat*: Kerrville, Texas; Shovel, Mt. Texas (July), 2 ♂'s. Type and cotype coll. Barnes. 4 ♂'s (Texas). Cotypes, Tring Museum, England.

Dr. K. Jordan, with whom we have recently had some correspondence concerning this group, has called our attention to this species and expressed the desire that we describe it. We take pleasure in doing so, as the characteristic feature seems very constant.

## FURTHER NOTES ON ALBERTA LEPIDOPTERA.

BY F. H. WOLLEY DOD, MIDNAPORE, ALTA.

(Continued from page 244.)

423. *S. athabasca* Neum.—The only locality given for this species in Smith's Catalogue is "British Columbia," presumably on the strength of the description, which I have not seen. But I have seen the type, a male, in the Neumœgen collection, and it is labelled "Belly River," which is in Southern Alberta, and no portion of it in B.C. I have seen the species fairly swarming around Gleichen, and on the Blackfoot Indian Reserve near there. It is almost or quite exclusively a day flier, and revels in hot sunshine, usually accompanied, in far fewer numbers, by *Melicliptera septentrionalis* and *Melaporphyria oregonica*. The Laggan specimens I referred to as having orange secondaries are *petricola* Walker, described from Rocky Mountain specimens taken by Lord Derby's collectors. A prairie and a mountain series of these respectively might easily give every impression of two species, especially if the series were short ones. Mountain specimens are usually a trifle more robust and larger, have yellowish or orange secondaries and ochreous tinted primaries, the depth of this tint varying as the depth of color of the secondaries. In size, my prairie specimens vary from about 28 to 31 mm., smaller specimens being uncommon. Mountain specimens seem to average scarcely more than 1 mm. larger, but my largest specimen, a handsome female from Field, B.C., expands very nearly 35 mm. My darkest and most richly coloured example is from Windermere, also in B.C. But an orange-tinted form is rare on the prairie, and a form with creamy white ground is equally rare in the mountains. Each of these grades through to the predominating form in their respective districts, and the extremes in each overlap those in the other. I regret to say that my entire series of these at present consists only of twenty-five specimens, but I have examined a good many more, both dried and in nature, and after years of deliberation have come to the conclusion that the balance of evidence is strongly in favor of there being only one species.

*Petricola* may stand for the form with orange secondaries. Walker's type happens to be paler than average mountain specimens. The names of course should be reversed, thus:

*S. petricola* Walk.—Ground color of primaries creamy ochreous, secondaries orange. Alberta Rocky Mountains. Rare on the prairie.

Var. *athabasca* Neum.—Ground color of all wings whitish, sometimes pure white. Alberta prairies. Rare in the mountains.

It usually flies on the prairies from the middle of June to the middle of July. My mountain specimens are dated from June 30th to July 27th, but I don't know that I was ever in the mountains before the earlier date. It flies most freely at low levels, but my palest mountain specimen comes from 7,500 feet on Mt. Saskatchewan, and was taken by Mrs. Nicholl. I have a female from Eureka, Utah, which is probably *petricola*. *Athabasca* is well figured by Holland on Pl. XXX., f. 29. What his fig. 35 is I don't know. It may possibly be a worn specimen of this species, but shows more reddish in the secondaries than any of mine. It certainly is not *alleni*. Grote's type of *alleni* in the British Museum appeared to me to be *adumbrata*, as did also the *alleni* of the Henry Edwards collection.

An analogous case to this amongst Alberta butterflies is perhaps found in *Argynnis electra*, which is the predominating form in the mountains where *lais* is rare; whereas *lais* is the normal prairie form, where *electra* is seldom met with.

424. *S.* sp.—I had listed this as *hudsonica*, and it is the *hudsonica* of the Kootenai List. I do not feel quite confident that it is not a variation of that species (No. 422), but I have so far been unable to connect them. I have never taken it on the prairie, nor nearer to Calgary than Laggan, but have seen it on the wing in the daytime in abundance all through the mountains during July, and Dr. Dyar records it apparently as somewhat common in the Kootenai from May 29th to July 13th. So far as the males are concerned, the maculation and color scheme is practically identical with *hudsonica*, but the tone is very much darker, there being more inoration with black scales, and all the black shades blacker.

Both species have usually a fuscous transverse bar or shade through the outer portion of the median pale band on the primaries in both sexes. This is normally very distinct, and I have no specimens in which it is not at least traceable. In the males only of both, this bar or shade is sometimes chestnut brown, and when best developed this is very conspicuous, as it is the only portion of the fore wing, and that almost of the palest ground, in which this color appears. In *hudsonica* this takes somewhat the form of a bar with well-defined edges, and may consist of a broadly geminate waved brown line, with the included space paler brown. In No. 424, though often broader, it has ill-defined edges, coalescing gradually with the pale ground.

But the most obvious superficial difference between the forms is seen in the females. Whereas in *hudsonica* this sex has the primaries much greyer and more even, with the maculation partially obsolete or ill-defined, in No. 424 the sexes are alike, with the exception that in neither case is the brown-barred variation found in the females, at least so far as I have yet observed.

In the Kootenai List, Dr. Dyar referred to the brown-barred form as var. *seposita* Hy. Edw., and I found a series of such forms separated under that name in the Washington Museum. I saw a male type of *seposita*, from Colorado, in the Henry Edwards collection. It certainly seemed near this form, and may be the same, though I did not compare a specimen, and do not feel at all convinced of its identity. There is another male type in the Neumœgen collection.

The ground color of the secondaries of *hudsonica* is pale creamy white. In No. 424 it is darker, a trifle ochreous, sometimes slightly orange. Holland's Plate XXX., fig. 31, under *hudsonica*, is apparently this form, and I can match it very closely in my collection.

It is quite possible that this is a somewhat similar example of what I believe to be racial variation in *petricola* and *athabasca*, and that *hudsonica* is easily influenced by environment and has developed strongly marked races in localities no great distance apart.

430. *Philometra metonalis* Walk.—The type is a male from St. Martin's Falls, Hudson Bay Territory. It is a very even specimen, and has scarcely any trace of transverse lines. *Gaosalis*

Walk. (not *goasalis*), from Nova Scotia, a male from Lieut. Redman, is better marked. They appeared to me to be the same species, and the one here listed.

THYATIRIDÆ

433. *Pseudothyatira expultrix* Grt.—I have seen a specimen from Edmonton, taken by Mr. F. S. Carr, on June 10th, 1910. The same collector also submitted to me a specimen of *cymatophoroides*, taken on July 17th of the same year, which is now in my collection. These forms appear to me to be distinct species, as the transverse lines differ. In *cymatophoroides* the posterior edge of the transverse anterior bar is much less waved or crenate than in *expultrix*, and the same is true of the t.p. line, which in *expultrix* is generally deeply crenate. This difference is most obvious near the anal angle, where is the dark-brown patch generally so conspicuous in *cymatophoroides*. This patch is sometimes much reduced, whilst in one of my Vancouver specimens of *expultrix* there is a small patch of dark brown after the t.p. line at this point, though the line itself is deeply crenate. The same specimen has no trace of dark brown in the t.a. bar.

In the Kootenai List, Dr. Dyar suggested that these forms might be distinct, as he found a slight, though apparently not constant, difference in the larvæ.

*NOTODONTIDÆ.*

436. *Melalopha albosigma* Fitch.

437. *M. brucei* Hy. Edw.—I have occasionally taken both these species at light, not uncommonly, at the end of May and early June.

439. *Notodonta simplaria* Graef.—High River (Baird). Also at head of Pine Creek, May 29th, 1910.

440. *Phecsia dimidiata* H.-S.—One at light at head of Pine Creek, June 5th, 1910. High River, May 7th, 1910 (Baird).

441. *Harpyia scolopendrina* Bdv.—I have about twenty local specimens under this name, and have taken more, May 11th to June 5th. Also one from Banff (Sanson), June 25th. I have not been able to verify the name. It is doubtfully the same as the species figured by Holland on Plate XXXIX., Fig. 11., being paler in ground colour, with much more distinct lines in the postmedial area, and

none of my specimens have as wide a band. In all my series the median band is entire.

442. *H. modesta* Huds.—Besides the three previously referred to, I have only taken four more specimens, on June 7th and 17th, 1910. In three out of this series of seven the median band is broken centrally and forms two quite distinct blotches. In a fourth it is so constricted that the margins nearly meet below the median vein. The others are not unlike Holland's *scolopendrina*, referred to above, and have a similar band on secondaries, but the ground colour of my specimens is more ochreous, the transverse postmedial lines more distinct, and the discal dot on all wings heavier. I query the name, as I find I have made a note to the effect that, "Packard's figure of *borealis* is the '*modesta*' of my Calgary list." If the note and Packard's figure are correct, it remains to be discovered what is the correct name for the species—not in my collection—figured by Holland as *borealis*, and standing as such in the British Museum.

442a. *H.* (? var.) *albicoma* Strk.—I have thirteen Alberta specimens in my collection, from Red Deer River and head of Pine Creek, collected by myself, and from High River, from Mr. Thomas Baird. May 30th to July 7th. I have the same form from Wellington, Vancouver Island, and it is that figured by Holland under this name. It differs from what I hold as *scolopendrina* in the slightly paler and less smoky ground, in the narrower median band, which is often much constricted and sometimes divided into two blotches, in the greater preponderance of fulvous scales, especially in the band, and in having the discal spot on primaries more usually punctiform than linear. In my former notes, the words, "has no fulvous scales," were a grave error, as were also "the two inner lines of the three beyond the cell are obsolete" (Vol. XXXVIII., p. 52, Feb., 1906). The form is hard to separate from what I hold as *scolopendrina*, and may not improbably prove a variety of that.

443. *Gluphisia septentrionalis* Walk.—High River (Baird). Two females, June 30th and July 7th.

444. *G. lintneri* Grt.—A few more specimens have come to hand, April 19th, 1906, May 26th, 1907, and one in 1911. The first of these was taken flying in sunshine.

## *LIPARIDÆ.*

446. *Notolophus antiqua* Lin.—I have occasionally seen the male of this species on the wing in sunshine during September in some numbers, and have bred it from Salix.

447. *Olene vagans* Barnes & McDunnough, var. *grisea* B. & McD. (Contributions, Vol. II., No. 2, pp. 60 to 63, pl. III., April, 1913).—This is the species standing as *Olene plagiata* Walk. in our lists, and was supposed to be the *Acyphas plagiata* of Walker. When at the British Museum early in 1912 I saw Walker's type, and recognized it as the well-known *leucostigma* of Abbott and Smith. This is referred to by Messrs. Barnes & McDunnough on page 50 of their "Contributions" quoted above, and Walker's type is figured on Plate VII., Fig. 1. Those authors considered the present species unnamed, and described it accordingly as *vagans*. They divided it into three sub-species: (a) *vagans*, types from St. Johns and Montreal, Que., and Yaphang, L. I.; (b) *grisea*, types from Eureka and Provo, Utah; (c) *willingi*, types from Humboldt, Sask. I have seven Alberta specimens, six males and a female, from Red Deer River, head of Pine Creek, and High River, the latter from Mr. Baird, June 17th to July 27th. All of these seem referable to *grisea*. I have the same form from Cartwright, Man., Wellington, V. I., and Eureka, Utah.

## *GEOMETRIDÆ.*

452. *Rachela bruceata*.—The larvæ of this species have again denuded hundreds of acres of *Populus tremuloides* in this district during the present year (1913). The denudation is greater in extent than it was ten years ago, though none has been observed during the intervening period. After starving themselves out on a patch of poplars, they spread to neighboring species of *Salix*.

453. *Talledega montanata* Pack.—Red Deer River, July 8th, 1905; Banff, June 28th—July 1st, 1907. The Banff specimens, like a series from Field, B. C., are rather darker than those from the prairie, and have duller secondaries.

486. *Mesoleuca hersiliata* Guen.—I have taken two more specimens, on August 24th, 1907, and July 24th, 1909.

490. *Hydriomena multiferata* Walk.—Lake Louise, Laggan, July 18th, 1907, one specimen.

491. *H. custodiata* Grt.—Three more specimens. Red Deer River, July 21st and 24th, and head of Pine Creek, July 27th, all in 1907.

493. *Cænocalpe magnoliata* Guen.—Two more specimens, at Head of Pine Creek, on July 15th, 1906, and July 16th, 1911; one at Banff, July 1st, and another at Laggan, July 18th, 1907.

495. *C. topazata* Grt.—Head of Pine Creek, May 26th, 1907.

498. *Xanthorhoe abrasaria* H.-S.—One at Head of Pine Creek, July 3rd, 1904.

501. *X. turbata* Hbn., syn. *circumvallaria* Taylor.—I quoted Mr. Prout's MS. reference in a footnote to my previous notes. The same reference is made by Messrs. Barnes & McDunnough in Vol. XLIV., p. 274, Sept., 1912. Taylor described it from Laggan specimens only.

502. *X. fossaria* Taylor—Described from three males and a female from Laggan, Alta., and two males from Mt. Cheam, B. C. One from the latter locality is the type (CAN. ENT., XXXVIII., 401, Dec., 1906). In March, 1906, I visited Mr. Taylor, and received from him, amongst other species, a series of six Wellington specimens as *fossaria*, bearing dates of June 15th to 30th, 1902 and 1905. They certainly look to me the same species, but it is strange that no mention is made of its occurrence at Wellington in the description.

503. *Synelys enucleata* Grt.—Two more Red Deer River specimens, July 24th, 1907.

519. *Deilinia borealis* Hulst.—I have a female taken by Mrs. Nicholl at Banff on June 24th, 1907.

(To be continued.)

## ODOUR PREFERENCES OF INSECTS.

BY HARRY B. WEISS, NEW BRUNSWICK, N.J.

Moths, butterflies, bees, flies and other insects feed upon the nectar of flowers, being guided to them presumably by the senses of smell and sight. Various investigators have differed in this, Lubbock claiming that bees, for instance, recognize at a distance and prefer certain colours; while Plateau found that neither form

nor colour played any part in attracting insects and that they were guided entirely by a sense of smell.

This sense is defined by Forel as "a special sense which allows the animal to recognize at a distance by some specialized energy the (chemical) nature of a certain body." Our scientific knowledge of odours is rather meagre. Some are known vaguely as pleasant or unpleasant and for many we have no definite names whatever, and are forced to liken them to the few odours with which we are familiar and for which we have definite names. Moreover, some smells are exceedingly complex experiences involving elements of taste, touch and vision. The most satisfactory classification of smells is that adapted by Zwaardemaker from the classification of Linnæus, which groups natural objects according to similarities, but does not aim to itemize all smells. This list is as follows:

1.—Ethereal smells, including all fruit odours.

2.—Aromatic smells; for example, those of camphor, spices, lemon, rose.

3.—Fragrant smells, those of most flowers.

4.—Ambrosiac smells—all musk odours.

5.—Alliaceous smells—those of garlic, asafœtida, fish, chlorine.

6.—Empyreumatic smells—those of tobacco, toast.

7.—Hircine smells—those of cheese, rancid fat.

8.—Virulent smells—those of opium.

9.—Nauseating smells—those of decaying animal matter.

In the Lepidoptera practically all members are attracted by fragrant smells. The Coleoptera have a somewhat wider range. Dermestidæ are attracted by fragrant and also hircine odours; *Dermestes lardarius*, for instance, the larva of which feeds on bacon, cheese, meat and feathers. The bumble flower beetle, *Euphoria inda*, finds ethereal and fragrant odours to its liking, being found feeding on peaches, grapes, apples and the pollen of flowers. Locust borers and soldier beetles are plentiful on golden-rod and various Buprestids also visit flowers, while the cigarette beetle has an empyreumatic taste. The Silphidæ, however, are drawn to nauseating odours, feeding, as they do, on decaying flesh.

With the exception of the ants, nearly all Hymenoptera are attracted by fragrant odours and also ethereal odours, the Vespidæ and bees being very fond of nectar and fruit juices. Ants have a

wider range, ethereal, alliaceous, hircine and nauseating odours all being more or less attractive.

The range of the Diptera is exceptionally wide, embracing ethereal, fragrant, alliaceous, hircine and nauseating odours. Certain species of mosquitoes, bee flies, and syrphus flies are found feeding on nectar. *Eristalis tenax* visits cesspools, dung-pits and decaying vegetable matter in addition to different flowers. Drosophilidæ visit decaying fruits both for food and egg deposition, and *Piophila casei* is drawn toward cheese, ham and partly spoiled vegetable matter; while the house fly, as everyone knows, shuns nothing except aromatic and virulent odours.

Robertson's records show clearly that the Hymenoptera and Diptera are especially fond of fragrant odours. He found that Pastinaca sativa was visited in twenty-six days by 173 Hymenoptera, 72 Diptera, 14 Coleoptera, 9 Lepidoptera, 6 Hemiptera and 1 Neuropteron; also that Asclepias verticillata was visited by 52 Hymenoptera, 42 Diptera, 16 Lepidoptera and 3 Coleoptera.

It would be extremely interesting to find the effect of exhaustion upon the end organs of smell. A bee, for instance, visiting innumerable flowers of the honeysuckle must have its organ fatigued by the continuous smelling of this one odor. How, then, would it react to other odours? Does its physiological mechanism of smell consist of distinct parts, one of which might be put temporarily out of commission without impairing the others, or does it consist entirely of one part?

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## THREE NEW GALL MIDGES (DIPTERA).

BY E. P. FELT, ALBANY, N.Y.

The following descriptions are of species which have been reared and of one concerning which we possess some exceptionally interesting data. There is much to be learned about our tropical or subtropical midge fauna. There must be hundreds of interesting and undescribed species existing in the West Indies and adjacent countries.

### *Karschomyia cocci*, n. sp.

The midges described below were reared from a sugar-cane mealy bug, Pseudococcus sacchari (?) collected at Central Providencia, Patillas, P.R., January 30, 1913, by Mr. D. L. Van Dine.

The type species of this genus, *K. viburni* Felt is easily distinguished by the almost trinodose character of the flagellate antennal segments of the male; while the only other known species, the Peruvian *K. townsendi* Felt, has much more slender flagellate antennal segments in the male, the stems in this latter each having a length 3½ times their diameter. Described from specimen in alcohol.

*Male.*—Length, 1 mm. Antennæ, ¼ longer than the body, rather thickly haired, yellowish brown; 14 segments, the fifth having the stems with a length 1½ and two times their diameters, respectively; circumfili and setæ well developed. Palpi: First segment short, subquadrate; the second with a length three times its diameter, the third ½ longer, more slender; the fourth ½ longer than the third. Mesonotum dark brown, the submedian lines fuscous yellowish. Scutellum and postscutellum yellowish. Abdomen yellowish white, the dorsal sclerites and genitalia somewhat fuscous. Halteres pale yellowish. Coxæ and femora mostly pale yellowish; tibiæ and tarsi fuscous yellowish. Claws slender, strongly curved, the anterior unidentate, the pulvilli rudimentary. Genitalia: basal clasp segment moderately stout, the posterior external angles somewhat produced and bearing a group of three or four stout setæ; terminal clasp segment subapical, swollen near the middle, curved; dorsal plate long, deeply and narrowly emarginate, the lobes broad, narrowly rounded.

*Female.*—Length, 1.5 mm. Antennæ extending to the third abdominal segment, sparsely haired, dark brown; 14 segments, the fifth with a stem about ¼ the length of the cylindric basal enlargement, which latter has a length about twice its diameter; terminal segment produced, the enlargement with a length three times its diameter and apically a broad, knoblike appendage. Mesonotum dark brown, submedian lines indistinct. Scutellum and postscutellum yellowish. Abdomen yellowish orange, the dorsal sclerites somewhat fuscous. Ovipositor short, yellowish, the terminal lobes narrowly oval. Halteres: Coxæ and femora mostly pale yellowish; tibiæ and tarsi light straw. Type, Cecid a2415.

*Mycodiplosis insularis*, n. sp.

This midge was reared from a vial containing leaves of Leonotis nepetæfolia abundantly infested with red spider. There

were also small, white cocoons among the colonies of red spider collected at Pio Piedras, P.R., August 6, 1913, by Thomas H. Jones. This species appears to be allied to *M. reducta* Felt, from which it is most easily separated by its larger size and the somewhat longer distal stem of the 5th antennal segment. Described from specimens in alcohol.

Larva.—Length, 1.3 mm.; moderately stout, pale yellowish. Head apparently with a length nearly twice its diameter, broadly rounded anteriorly. Antennæ long, with a length fully 10 times the diameter, slender, curving, posterior extremity subtruncate and irregularly papillate.

*Male.*—Length, 1 mm. Antennæ, ¼ longer than the body, sparsely haired, light brown; 14 segments, the 5th having the stems with a length 1½ and 2½ times their diameters, respectively; circumfili well developed. Palpi: the first segment short, subquadrate, the second with a length twice its diameter, the third a little longer, more slender, the fourth ½ longer than the third. Mesonotum dark reddish brown, the narrow submedian lines yellowish. Scutellum and postscutellum pale yellowish. Abdomen mostly pale yellowish, the dorsal sclerites slightly fuscous. Halteres, coxæ and femora mostly pale yellowish, tibiæ and tarsi light straw. Claws slender, strongly curved, the pulvilli as long as the claws. Genitalia: basal clasp segment moderately stout, terminal clasp segment swollen basally, slightly curved; dorsal plate moderately long, deeply and roundly emarginate, the lobes narrowly rounded.

*Female.*—Length, 1.25 mm. Antennæ extending to the second abdominal segment, sparsely haired, light brown; 14 segments, the fifth with a stem ¼ the length of the cylindric basal enlargement, which latter has a length 2½ times its diameter; terminal segment slightly produced, with a length three times its diameter, broadly rounded apically. Face yellowish brown. Ovipositor short, yellowish, the lobes narrowly oval. Type, Cecid a2413.

*Clinodiplosis examinis*, n. sp.

The midges described below were present by hundreds, if not thousands, upon a screen door, or hanging from cobwebs attached thereto at Nassau, N.Y., June 19, 1913. The insects were so

numerous as to fairly dot the surface of the screen here and there, and where spider webs occurred it was not uncommon to see 5 or 6 in a line usually about a quarter of an inch apart. They hung lightly from the web, were easily disturbed and frequently returned to their fragile supports.* The insects were so numerous that it was comparatively easy to capture some 50 with an ordinary collecting bottle by simply placing it over groups of three or four here and there on the screen. The midges had not been observed previously and presumably represent the emergence of a brood from some nearby food plant or food material, possibly plant lice inhabiting adjacent maple or elm trees.

*Male.*—Length, 1 mm. Antennæ fully ½ longer than the body, thickly haired, light brown; 14 segments, the fifth having the two portions of the stems 3 and 3½ times their diameters, respectively; the distal enlargement with a length ¾ greater than its diameter and a slight constriction near the basal third. Palpi: first segment subquadrate, with a length fully twice its diameter; the second a little longer, more slender; the third nearly twice the length of the second, somewhat dilated; the fourth a little longer than the third, more slender. Mesonotum yellowish brown. Scutellum brownish yellow, post scutellum fuscous yellowish. Abdomen mostly reddish brown, the genitalia reddish yellow. Costa fuscous straw. Halteres mostly yellow transparent, slightly fuscous subapically; Coxæ and femora mostly pale yellowish, the tibiæ and tarsi fuscous straw; claws slender, strongly curved, the anterior unidentate, the pulvilli about half the length of the claws. Genitalia: basal clasp segment moderately stout; terminal clasp segment long, slightly swollen basally; dorsal plate short, broad, deeply and triangularly emarginate, the lobes broadly rounded; ventral plate long, rather broad, broadly and roundly emarginate, the lobes short and with a few coarse setæ apically; style long, stout, tapering.

*Female*: Length, 1.5 mm. Antennæ nearly as long as the body, sparsely haired, reddish brown; 14 segments, the fifth with

*Mr. Frederick Knab (N.Y. Ent. Soc. Journ. 20: 143—46) records a number of Diptera as habitually occuring on spider's webs. In this connection it is worthy of note that Mr. D. B. Young found last June at Albany N. Y. a Tipulid hanging on cobwebs, leaving and returning thereto at will. The species appears identical with a specimen in the state collection determined by Mr. C. P. Alexander as Oropega obscura.

a stem nearly ¾ the length of the cylindric basal enlargement, which latter has a length about twice its diameter; terminal segment produced, the basal enlargement cylindric, with a length more than three times its diameter and apically a finger-like process. Palpi: first segment subquadrate, with a length more than twice its diameter, the second twice the length of the first, the third a little longer, somewhat dilated; the fourth a little longer and more slender than the third. Mesonotum slaty brown, the submedian lines indistinct. Scutellum yellowish, postscutellum fuscous yellowish. Abdomen brownish red, the dorsal sclerites somewhat fuscous. Ovipositor reddish yellow. Halteres yellowish transparent, fuscous subapically. Coxæ pale yellowish, femora light straw, tibiæ and tarsi fuscous straw. Ovipositor stout, nearly as long as the abdomen, the terminal lobes lanceolate, sparsely setose. Type, Cecid a2411.

Described from a number of males and females taken together and presumably specifically identical.

## A NEW SPECIES OF HELIOTHRIPS (THYSANOPTERA) FROM MARYLAND AND ILLINOIS.

BY J. DOUGLAS HOOD,
United States Biological Survey, Washington, D. C.

The systematist's interest in the genus *Heliothrips* Haliday is enhanced by the fact that it includes several of the best known and most troublesome species of the order. *Hæmorrhoidalis* and *femoralis* are cosmopolitan greenhouse pests; *rubrocinctus*, a widely distributed tropical species, injurious to cacao, has lately appeared in Florida as an enemy of the mango and avocado; *fasciatus* often proves troublesome to beans and other crops in California; while the recently described *phaseoli* is an important bean pest in southernmost Texas.

In a recent paper on the genus,* Dr. Karny unites *Dictyothrips* and *Parthenothrips* with *Heliothrips*, recognizing them as subgenera only, and erects a fourth subgenus, *Selenothrips*, for a new species which he calls *decolor* and for *rubrocinctus* Giard. While admitting that *Selenothrips* is a well-founded subgenus, I can not follow Dr. Karny in his treatment of *Dictyothrips* and *Parthenothrips*. In the

*Revision der Gattung *Heliothrips* Haliday, Ent. Rundsch., 28 Jhg., no. 23, pp. 179-182, 5 figs.; 1911.

sinking of the former, Dr. Karny was led into error by Dr. Hinds' description of *Heliothrips fasciatus* Pergande,** in which the number of segments in the maxillary palpi is erroneously given as three, instead of two—a mistake which was copied also by Moulton.*** *Dictyothrips* is thus readily separable by the three-segmented maxillary palpi; while the number of antennal segments and the decidedly anomalous character of the fore wings marks *Parthenothrips*, in my opinion, as one of the most distinct genera of the entire family.

The new species described below is the tenth one of the genus to be recorded from North America; and as the entomological fauna of the tropical and sub-tropical south becomes better known, this number will doubtless be greatly increased.

*Heliothrips striatus*, sp. nov.—Figs. 11 and 12.

*Female.*—Length about 1.1 mm. General color, dark blackish brown (nearly black); head and thorax paler than abdomen, the former with a yellow spot each side of the ocelli; legs dark brown, with the femora and tibiæ paler at extremities; tarsi pale; abdomen slightly paler at tip.

Head about 1.6 times as wide as long and about equal in length to prothorax; cheeks rounded to eyes, narrowed to base; dorsal

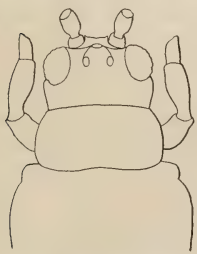

FIG. 11.—Head and prothorax.

FIG. 12.—Portion of fore wing.

*Heliothrips striatus* Hood.

surface reticulate, roughened between the lines of reticulation; frontal costa broad, much wider than first antennal segment; vertex

subcarinate in front of ocelli. Eyes less than twice as long as their distance from posterior margin of head, slightly protruding, setose. Ocelli approximate, the posterior pair opposite center of eyes. Antennæ about 2.3 times as long as head; segments 1 and 2 light brown; 3, dark gray, paler in second fifth; 4, dark gray, pale in basal half; 5, pale grayish white, slightly darker apically; 6–8, dark gray. Maxillary palpi two segmented.

Prothorax twice as wide as long, about equal in length to head and with similar reticulation. Pterothorax somewhat broader than prothorax, dark brown in color. Wings long, surpassing the abdomen; fore wing about thirteen times as long as width at middle and with two veins nearly or quite attaining tip; basal vein with four spines, of which the distal is much stouter, black, and situated at the fork (see figure 12); anterior vein usually with one spine (rarely two) at base and two near apex of wing, all black, the basal one unusually stout; posterior vein with five or six equidistant spines at middle, of which three or four are black; fore wings slightly darkened with brown at extreme base, clear white in basal fourth, nearly black in second and third fourths (darkest toward base), clear white again in seventh eighth, and nearly black again in apical eighth, where it is margined with darker.

Abdomen broadly ovate, pointed at tip; *notum of segments 1-8 closely striate laterally*, the striæ transverse toward middle of segment and longitudinal at sides. Segment 10 without longitudinal dorsal suture, though irregularly weakened toward tip.

Measurements of holotype: Length, 1.07 mm.; head, length .120 mm., width .192 mm.; prothorax, length .114 mm., width .228 mm.; mesothorax, width .324 mm.; abdomen, width .372 mm. Antennal segments: 1, 21$\mu$; 2, 45$\mu$; 3, 50$\mu$; 4, 45$\mu$; 5, 41$\mu$; 6, 32$\mu$; 7, 15$\mu$; 8, 34$\mu$; total length of antenna, .28 mm., width at segment 4, .027 mm.

*Male.*—Length about .84 mm. Sternum of abdominal segments 3-7 each, with a large, pale, transverse area about nine times as wide as long. Segment 9 with two pairs of dorsal spines, of which the basal is much shorter and stouter than the apical.

**Proc. U. S. Nat. Mus., vol. XXXVI, p. 174; 1902.
***Tech. Ser. 21, Bur. Ent., U. S. Dept. Agr., p. 14 ; 1911.

Measurements of allotype: Length .84 mm.; head, length .102 mm., width .168 mm.; prothorax, length .090 mm., width .196 mm.; mesothorax, width .252 mm.; abdomen, width .228 mm.

Described from three females and one male, taken near Chevy Chase Lake, Maryland, July 6, 1913, by W. L. McAtee, on the under surface of leaves of a tulip tree (*Liriodendron tulipifera* L.); and from one female collected at Parker, Illinois, July 14, 1909, by C. A. Hart, on the same food plant.

*Type locality*: Chevy Chase Lake, Maryland.

The abdominal sculpture is almost identical with that of *H. phaseoli*, figured by the writer in Psyche, Vol. xix, No. 4, plate 8, fig. c, August, 1912. From that species it may be known by the broader head, the much darker color of the body, the details of wing coloration, and the stout black spines on the fore wings at the junction of the two principal veins.

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## ANOTHER RED SPECIES OF THE GENUS *OLIGOSITA*.

BY J. C. CRAWFORD, WASHINGTON, D. C.

*Oligosita girault*i, new species.

Female.—Length about 0.5 mm. Brilliant vermilion, including marginal and stigmal veins of fore wings and marginal vein of hind wings; the femora and hind tibiæ red, the red color decreasing apicad on legs and the rest of legs testaceous; submarginal vein with a bristle at middle, and one at apex of vein, near base of marginal vein a short one followed by two longer ones, then one or two shorter ones and a long at apex of vein, fore wings with no discal cilia; marginal cilia at apex of wing slightly longer than width of wing; fumated spot in under stigmal knob distinct; stigmal knob almost circular but with a projection apicad; pedicel about as long as the funicle joint, about as long as middle segment of club which is longer than either the first or third joints; base of abdomen with a whittish band, more or less suffused with reddish and occupying about one-fourth of the abdomen.

Type locality: St. Clair Experiment Station, Trinidad.

The type slide has two specimens reared from the eggs of *Tomaspis varia* by Mr. P. Lachmere-Guppy.

There is also a paratypic slide with one specimen with the record "Reared from grass, Verdant Vale, Jan. 30, 1913, and oviposited in frog hopper eggs" (same date). F. W. Urich, collector.

Type Cat. No. 15971. U. S. N. M.

Easily distinguished by the red color and coloring of the veins; *sanguinea* Girault lacks the red in the veins and *neosanguinea* Girault has a white band occupying about one-third of the abdomen, and the basal joint of the club is at the second.

The species is named in honor of Mr. A. A. Girault who has done most of the work in this family.

Mr. Lachmere-Guppy writes that "this insect in life is vermillion with jet black eyes, and acts like a mymarid".

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Mailed September 12th, 1913.

The Canadian Entomologist.

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# REPORT ON A COLLECTION OF JAPANESE CRANE-FLIES (TIPULIDÆ), WITH A KEY TO THE SPECIES OF PTYCHOPTERA.

BY CHARLES P. ALEXANDER, ITHACA, N. Y.*

(Continued from page 295).

Tribe *Limnophilini.*

Genus *Limnophila* Macquart.

KEY TO THE JAPANESE LIMNOPHILÆ.

1. Wings unspotted (subgen. *Limnophila*) ..... *inconcussa*, sp. n.
   Wings marked with brown (subgen. *Pœcilostola*) ..... 2.
2. Large species (male, length 22-25 mm.; wing over 15 mm.); wings with a few large seams or blotches.... *satsuma* Westw.
   Small species (male, length 10-13 mm.; wing under 12 mm.) wings with abundant dots in the cells..... 3.
3. Legs and abdomen yellow throughout; petiole of cell $M_1$ as long as cell 1st $M_2$..... *varicornis* Coq.
   Legs with segments tipped with brown; abdomen yellow and brown; petiole of cell $M_1$ longer than cell 1st $M_2$..... *japonica*, sp. n.

*Limnophila inconcussa*, sp. n.

Wings unspotted; cross-vein r far from tip of $R_1$.

Rostrum brownish yellow beneath, brown above, palpi brown; antennæ dark brown, the third segment more yellowish at its base; antennæ short, reaching about to the wing basis; front, vertex and occiput dark brown, dusted with grey.

Mesonotum greyish with a median brown stripe; pseudo-sutural fovea and tuberculate pits very distinct, black; scutum, scutellum and postnotum brown, pleuræ dark brown (probable that the body, in dried specimens, is grey). Halteres pale. Legs: coxæ and trochanters dull yellow; femora yellow, a little darkened

*Contribution from the Entomological Laboratory of Cornell University.

before the tip; tibiæ yellow, brown at tip; first tarsal segment yellow, brown at tip, remainder of tarsi brown. Wings with a brownish yellow tinge; stigma indistinct, brown; veins Sc and R yellow, remainder brown. Venation (see fig. 2, pl. II): $R_{2+3}$ arcuated, long, cross-vein r almost at its fork; Rs long; cross-vein r-m more distad than fork of cell; basal deflection of $Cu_1$ at or slightly beyond the fork of M.

Abdomen: tergites light brown; sternites much paler, yellowish. Hypopygium (see fig. 12, pl. X): pleurites elongate, slender, cylindrical, clothed with long hairs; two apical appendages, elongated, the outermost longest, more slender, chitinized, directed cephalad, its tip produced into a slender spine and its inner or cephalic edge near the tip armed with blunt denticulæ; inner appendage shorter, a little stouter and more fleshy, clothed with long hairs, especially on the inner face; the anal tube prominent, oval.

Vial No. 2.—Tokyo, Japan; 1 ♂, 1 ♀.

Vial No. 9.—Tokyo, Japan; April 25, 1912; 2 ♂, 2 ♀.

Vial No. 17.—Tokyo, Japan; April 25, 1912; 3 ♂, 7 ♀.

Vial No. 27.—Tokyo, Japan; April 25, 1912; 4 ♀.

Holotype.—♂, Vial 2.

Allotype.—♀, Vial 2.

Paratypes.—5 ♂, 13 ♀, in Vials 9, 17 and 27.

Types in author's collection; paratypes in U. S. National Museum and Cornell University collections.

Of the American species, *inconcussa* is most like *toxoneura* O. S. (East. U. S.), but the cross-vein r is removed from the tip of $R_1$, fusion of $R_{2+3}$ is longer, etc.; the coloration of the two species is quite different. In Verrall's key to the British species (Ent. Mo. Mag., April, 1887, p. 264, 265), it runs down to *lucorum* Meig., which has a dark brown abdomen, brown legs, etc.

*Limnophila* (*Pœcilostola*) *satsuma* Westwood.

1876.—*Limnobia satsuma* Westwood, Trans. Ent. Soc. Lond., p. 504, pl. 3, fig. 5a, 5b.

1881—*Limnobia satsuma* Westwood, Trans. Ent. Soc. Lond., p. 383.

1888.—*?Epiphragma satsuma* Bergroth, Ent. Tidskrift, p. 138.
1902.—*Limnobia satsuma* Kertesz, Cat. Dipt., Vol. 2, p. 177.

*Male*—Length 22.6 mm.; wing 16.8 mm.; hind leg, femur 14.1 mm.; tibia 12.2 mm.

*Male*—Rostrum and palpi brown, the apical segment of the latter darker; antennæ, segments one and two dark brown, flagellum yellow except the two last segments which are brown; front dark brown, vertex and occiput reddish brown, a narrow median streak continued back from the front.

Pronotum with the scutum dark brown, scutellum yellowish. Mesonotal præscutum rich reddish brown, the lateral margins of the sclerite more greyish, a darker brown median triangle, broadest in front, narrowed to a point at the suture, lateral stripes similar in colour to the median stripe; scutum, lobes dark brown, median line yellowish, dark brown on caudal portion; scutellum and postnotum dark brown. Pleuræ light brownish yellow; propleuræ and dorsal portions of the mesopleuræ up to the wing; root dark brown; mesostigma very large, conspicuous, situated just behind and under the pronotal scutellum. Halteres short, stem yellow, knob brown. Legs: coxæ light yellow; trochanters reddish yellow; femora yellow, tip brown, with a still darker subapical ring; tibiæ slightly darkened at the extreme base, a whitish sub-basal annulus, tip narrowly dark brown: tarsi brownish yellow, tips of the segments darker; legs conspicuously hairy. Wings (see fig. 4, pl. III.): cephalic third deep yellow, caudal portions yellowish grey; surface with conspicuous brown marks: a large blotch at base of M; at origin of Rs; at the cord; a narrow seam to cross-vein r; paler crown margins to Cu and the veins in the vicinity of cell 1st $M_2$ (discal). Venation (See fig. 4).

Abdomen: tergites rich yellow, extreme apical margin of the sclerites darker; a brown lateral line; sternites lighter yellow, apices, especially of the terminal segments, darker. Hypopygium (See fig. 11, plate X.): viewed from beneath, 9th sternite with caudal margin straight, the sides oblique; pleuræ very short, stout; dorsal apical appendage directed inward, cylindrical, chitinized, its tip with a sharp recurved hook; ventral apical appendages, two, the outermost chitinized, broad at base, rapidly tapering to a sharp point, directed inward, the lower appendage

is fleshy at the base, more chitinized at the tip, its caudal or outer margin grooved to receive the outer appendage. Viewed from above, 9th tergite concave, with a projecting median lobe; anal tube conspicuous, more pointed at upper end than in *japonica*

One male (Vial No. C; Tokyo, Japan; August, 1912); I give the above description to supplement Westwood's brief characterization. The species agree with *barbipes* Meigen (Europe) in its conspicuously hairy legs.

*Limnophila* (*Pœcilostola*) *japonica*, sp. n.

Wings spotted; tibiæ and femora tipped with brown.

*Male*.—Length 10-13 mm.; wing 9.8 mm. Female, length 15 mm.; wing, 11-12.3 mm.

*Male*.—Rostrum and palpi dark brown; antennæ dark brownish black, except segment three, which is pale yellow basally, the tip brown; antennæ short, if extended backward it would barely reach the wing basis; segment one elongate, as long as the succeeding three combined; segments 2-5 broad, oval-pyriform, gradually becoming more cylindrical; segments 6-16 cylindrical more elongate toward the end; front, vertex and occiput dark brown.

Pronotum and mesonotum dark brown. Pleuræ dark brown. Halteres long, stem yellow, knob brown. Legs: coxæ and trochanters dull brownish yellow; femora light yellowish brown, the tip broadly brownish black; tibiæ with base narrowly dark brown, remainder yellow, except the broad dark brown tip; tarsi dark brownish black. Wings tinged with brownish, cells C and Sc rather brighter; veins yellowish brown; wing spotted with brown, varying greatly in the size of the markings; in one (♀, Vial A), there are large brown spots at origin of Rs, tip of Sc and fork of $R_{2+3}$, and abundant pale brown dots over the wing surface; in a second specimen (♂) the wing disk is heavily marked with brown, a series of brown marks in the costal cell, a large square blotch at origin of Rs, another at tip of $Sc_1$ extending partly down across the cord; others at tips of $R_1$, $R_2$ and $R_3$; large, paler brown dots in all the cells of the wing. Venation (see fig. 2, pl. III).

Abdomen: tergites brownish; sternites dull yellow, apical third of each sclerite brown. Hypopygium (see fig. 10, pl. X): viewed

from above, 9th tergite, caudal margin almost straight with a little rounded knob or hook on either side of the median line; pleurites very short and stout, with three apical appendages, the more dorsal being the longest, slender at base, swollen subapically, the extreme tip slightly hooked and strongly chitinized, this appendage directed caudad and entad; two ventral appendages, the more dorsal being short, blunt, very strongly chitinized at its tip and with numerous, triangular denticulæ, closely and regularly set; ventral appendage slender, curved at a right angle, its tip directed cephalad. Anal tube very conspicuous, pale whitish, slightly notched at its tip. Second gonapophyses rather slender, tips expanded, the organs directed caudad. Viewed from beneath, the 9th sternite has a rectangular median protuberence.

*Female.*—Similar, larger; the dark apices of the abdominal sternites not well marked.

Vial No. A.—Tokyo, Japan; April 25, 1912; 1 ♀.
Vial No. 7.—Tokyo, Japan; April 25, 1912; 2 ♂, 1 ♀.
Vial No. 18.—Tokyo, Japan; June 26, 1912; 4 ♀.
Vial No. 23.—Tokyo, Japan; June 25, 1912; 3 ♂.
Vial No. 48.—Tokyo, Japan; August, 1912; 1 ♂.
Holotype.—♀. Vial 48.
Allotype.—♀. Vial A.
Paratypes.—5 ♂, 5 ♀. Vials 7, 18, 23.

Types in author's collection; paratypes in U. S. National Museum and Cornell University Collections,

This species differs from *L. varicornis* Cog. (Japan)* in its shorter antennæ; legs not all yellow, but the segments conspicuously tipped with darker; abdomen not yellow; wings with petiole of cell $M_1$ much longer than cell 1st $M_2$, etc. *L. varicornis* also, is probably a *Pœcilostola*.

*Tribe Pedicini.*
*Genus Tricyphona* Zetterstedt.

KEY TO THE JAPANESE TRICYPHONÆ.

1. Wings hyaline or nearly so, not spotted or striped; cross-veins r-m connected with vein $R_{4+5}$ beyond the fork of Rs . . . . . *insulana*, sp. n.

*Proc. U.S. Nat. Mus. vol. 21, p. 304 (1893).

Wings spotted or striped with brown or yellow; cross-vein r-m connected with the radial sector at or before its fork.....2.

2. Wings with a broad, yellow subcostal streak, extending from the base of the wing to the apex; median cross-vein absent.....*kuwanai*, sp. n.

Wings with a narrow brown seam along the cord, and rounded brown spots on most of the cross-veins and at the ends of most of the longitudinal veins; median cross-vein present.....*velusta*, sp. n

*Tricyphona kuwanai*, sp. n.

Color yellow; mesonotum with black markings; wings with a conspicuous yellow longitudinal streak.

*Female*.—Length 15.8 mm.; wing 12.2 mm.; abdomen 12.4 mm.

*Female*.—Rostrum and palpi brown; antennæ, segment 1 brown, segments 2 to 16 light yellow, the terminal flagellar segments more brown; front and vertex brown, the hind part of the vertex, the occiput and the genæ clearer reddish brown.

Pronotum light yellow, brown medially. Mesonotal præscutum light brownish yellow, darkest medially, the sclerite with four rounded, velvety-dark brownish black spots as follows: a small rounded spot on either side of the median line, about mid-length of the sclerite; an oval spot on the sides of the sclerite, about midway between the pseudosuture and the transverse suture; a small triangular black spot on the middle of the transverse suture; scutum light yellow, with velvety-black marks as follows: a double, semilunar transverse mark on the cephalic portions of the sclerite, caudad of these marks are four small dots, the outermost larger, rounded, occupying the middle of the scutal lobes, the inner small and oval, on either side of the median line; a small elongate black mark on the suture, between the scutum and scutellum; scutellum and postnotum brown. Pleuræ light brownish yellow. Halteres light yellow. Legs: coxæ and trochanters light yellow; femora and tibiæ yellow, tip of the latter narrowly dark brown; first three tarsal segments light yellow, narrowly tipped with dark brown; segments 4 and 5 dark brown. Wings hyaline or nearly so, a broad yellow streak running from the base of the wing

around to beyond the apex, embracing the caudal portion of cell $C_1$, cell Sc, cephalic portion of cell R and 1st $R_1$, caudal portion of cell 2nd $R_1$ and outer half of cell $R_2$; cell C is hyaline with small, rather evenly spaced dark brown cross stripes; the margin of the wing from the end of cell C around to end of cell $R_5$ is light brown; the caudal margin of the longitudinal yellow streak above described is narrowly brown at the deflection of $R_2$, a slender brown streak runs caudad and outward along $R_{4+5}$, ending opposite the fork of $R_{1+2}$; Cu and 2nd anal margined with bright yellow. Venation (see fig. 6, plate III), Rs beyond the cross-vein r-m short, a little shorter than r-m; $R_2$, $R_3$ and $R_{4+5}$ all originate at a common point; $R_2$ at origin is perpendicular; cross-vein m lacking; basal deflection of $Cu_1$ at fork of M.

Abdomen: tergites light brownish yellow, with numerous slender black hairs; segment 2 with a short black sub-basal streak on the margin; segments 3 to 6 with longer marginal streaks, which cover almost the basal half of the sclerite; sternites light yellow, with black marks on the sides remote from the margin of sclerite, that on the second oblique, meeting its mate on the venter, the others longitudinal.

Vial No. 31.—Tokyo, Japan; May 7, 1912; 1 ♀.

Holotype.—♀, in Vial 31.

Type in author's collection.

*Tricyphona insulana*, sp. n.

Brown; wings hyaline without a stigma; no median cross-vein; legs largely yellow.

*Female*, length 9.6 mm.; wing 9.4 mm.

*Female*.—Rostrum and palpi dark brown apices of the palpal segments a little paler: antennæ, basal segments pale brown, flagellum dark brown; front, vertex and occiput dark brown, probably with a grey bloom in dry specimens.

Pronotum dark brown. Mesonotum dark brown with indications of stripes near the median line; it is probable that the thorax is covered with a grey bloom; scutum dark brown; scutellum brownish yellow; postnotum brown. Pleuræ brown. Halteres light yellow. Legs: coxæ yellow, more brown basally;

trochanters yellow; femora yellow, darkening to light brown at the tip; tibia light yellow, brown at tip; tarsi brown. Wings hyaline; veins light brown. Venation (see fig. 3, plate IV) cross-vein r-m connects $R_{4+5}$; no cross-vein m.

Abdomen: tergum reddish brown, segments with a dark brown apical ring; pleural line yellow; sternites brown, ovipositor with yellow valve.

Vial No. 27.—Tokyo, Japan; April 25, 1912; 1 ♀.

Holotype, ♀, Vial No. 27.

Type in author's collection.

Related to *T. vitripennis* Doane (West. U.S.) but lacks a brown stigma, has no median cross-vein, etc. From *T. immaculata* Meigen (Europe) it differs in having cross-vein r farther removed from the tip of $R_1$, cross-vein r-m far beyond the fork of Rs, not at it; the legs much more yellow, not mostly brown; ovipositor of the female yellow, not patch brown, etc.

*Tricyphona vetusta*, sp. n.

Wings spotted with brown; cross-vein m-cu of the wings present; cross-vein m present.

*Female.*—Length 16 mm.; wing 14.8 mm.; hind legs femora 8.4 mm.; tibia 10.3 mm.; tarsus 8.9 mm.

*Female.*—Rostrum light brownish yellow; palpi with segments dark brown, the apical ones with bases yellow; antennæ, base light brown, flagellum dark brown; front, vertex and occiput dark brown.

Pronotum dark brown. Mesonotum, præscutum, greyish with four brown stripes, the median one double, narrowed behind; scutum dark brown, the lobes paler brown; scutellum dark brown, much lighter on the sides; postnotum dark brown with a large oval spot behind on either side of the median line. Pleuræ dark brown, indistinctly variegated with darker. Halteres light yellow, the knob light brown. Legs: Coxæ, especially the fore and middle, brownish at the base, remainder light yellow; trochanters yellowish; femora yellow, darkening into brown at the tip; tibia yellowish brown, rather darker apically; tarsi dark brown. Wings, tinged with light yellow, cells C and Sc a little brighter, with

brown marks as follows: a rounded spot at $Sc_2$, a larger one at origin of Rs, a crossband on the cord running from the tip of $Sc_1$, down to fork of Cu and thence to the wing-margin along $Cu_2$; a round spot at cross-vein r, apical margin of the wing brown, a brown seam on cross-vein m, brown dots at ends of all the longitudinal veins; veins yellowish brown. Venation (see fig. 5, plate III); Rs in a line with $R_{4+5}$; $R_{2+3}$ short, gently arcuated; crossvein r very far distad so that $R_1$ beyond it is about equal to it in length; cross-vein m present, connecting $M_2$ with $M_3$; cross-vein m-cu present.

Abdomen: Tergites, segment one brown, segments two and six dull yellow, an indistinct median brown stripe becoming more plainly defined behind until on the 8th and 9th tergites it abruptly suffuses the entire sclerites; pleural stripe broad, dark brown, extending the length of the abdomen as a conspicuous lateral line; sternites light yellow, a rounded ill-defined brown mark on the 8th sternite.

Vial No. 26.—Tokyo, Japan; April 25, 1912; 1 ♀.

Holotype, ♀, in Vial 26.

Type in author's collection.

Related to *T. constans* Doane (West. U.S.) but is much smaller with a very different wing pattern. In venation, suggesting *T. vernalis* Osten-Sacken of the Eastern United States.

*Tribe Cylindrotomini.*
*Genus Liogma* Osten-Sacken.

*Liogma kuwanai*, sp. n.

Resembles *L. nodicornis* O. S., of the United States, but the tripartite penis-guard is very much longer and directed dorsad.

*Male.*—Length 15.9 mm.; wing 11.4 mm.; antennæ 3.8-3.9 mm.

*Male.*—Rostrum and palpi light brown, remaining segments dark brown; flagellar segments slender at base, the inner face produced into a subtriangular tooth, making the flagellum strongly serrate; front, vertex and occiput dull dark brown, very rugulose, the vertex broad.

Mesonotum dark brown, a lighter brown line extending from the median line of the scutum, branching Y-shaped and extending

to the pseudosuture, this pale line being somewhat impressed; scutum, scutellum and postnotum brown, the latter rather darker. Pleuræ, propleuræ and cephalic and dorsal portions of the mesopleuræ, up to the wing-root, yellowish; remainder of the pleuræ brownish. Halteres pale, yellow. Legs: coxæ suffused with brown; trochanters light yellow; femora yellow basally, becoming brown at the tip. Wings tinged with grey, stigma elongate-oval, brown, distinct. Venation (see fig. 4, plate IV).

Abdomen light brownish yellow, the caudal half of the 7th, 8th and 9th tergites brown. Hypopygium (see figs. 13-15, plate X): 9th tergite, viewed from above, with the lateral ears or lobes prominent, the interval between them almost straight, not deeply notched as in *nodicornis;* 9th sternite and its pleurite fused, massive, as in the genus, the apical appendate stout, directed cephalad, flattened at its apex. Viewed from the side, the penis-guard is conspicuous, tripartite as in the tribe, it is very long, arising from the ventral wall, directed caudad and thence dorsad, almost attaining the level of the dorsal edge of the 9th sternite, toward their end, directed cephalad, the tip flattened; anal tube conspicuous. Viewed from beneath, the massive sterno-pleurites meet in a straight median suture, which is membranaceous; the tripartite penis-guard is deeply concave below the forking.

Vial No. E.—Tokyo, Japan; Aug., 1912; 1 ♂.

Holotype.—♂, Vial E.

Type in author's collection.

The difference between the American and Japanese species are shown by the following key:

1. Abdomen brown; ♂ hypopygium, 9th tergite with a deep median notch; guard of the penis short, directed caudad. (East. U. S.) ..... *nodicornis* O. S.

   Abdomen reddish brown; ♂ hypopygium, 9th tergite without a deep median notch between the prominent lateral ears; guard of the penis elongate, conspicuous, directed caudad and dorsad, almost attaining the dorsal level of the abdomen. (Japan) ..... *kuwanai*, sp. n.

The succeeding parts dealing the Tipulinæ will conclude the Tipulidæ.

# THE CADDIS-FLIES (*TRICHOPTERA*) OF JAPAN. I.—FAMILY PHRYGANEIDÆ.

BY WARO NAKAHARA, HONGOKU, TOKIO, JAPAN.

Through the kindness of Mr. Miyake, who has generously permitted the free use of the valuable literature and collections in his possession, and has given me much valuable advice, I have recently had the opportunity of studying Japanese caddis-flies or Trichoptera. The purpose of the present study is to record the species known from Japan, offering such notes as may suggest themselves, and to describe any forms that appear to be unknown.

The present paper deals with the family Phryganeidæ, which includes some of the most beautiful caddis-flies in the world.

## FAM. PHRYGANEIDÆ.

### Genus *Neuronia* Leach.

1. *Neuronia regina* Maclachlan.

*Holostomis regina* MacLachlan—Journ, Linn. Soc. London, Zool., XI, p. 104 (1871); Matsumura, Thous. Ins. Jap., i, p. 165, Pl. XII, fig. 11, ♀ (1904).

*Neuronia regina* Ulmer—Cat. Coll. Selys, Fasc. VI (1), p. 6, figs. 1, 2 and 3, Pl. i, fig. 1 (1907); Ulmer, Gen. Insect., Pl. XXIX, fig. 3 (1907).

This magnificent species, which is common in China, as well as in India, is not rare in Japan.

The manner of flight of this species resembles that of a certain moth. Occasionally they are found on the bark of trees closely resembling the colour of the forewings, which always cover the abdomen and beautiful hind wings, when they are at rest.

Already reported from Hokkaido and Honto.

2. *Neuronia reginella* sp. nov.

Head blackish, clothed with brownish hairs, especially on the face; vertex wholly fuscous; ocelli brown; labial palpus consisting of four joints, brown; maxillar palpus four-jointed, the last joint more slender than others and fuscous; all the others mostly brown and each thickened at extremity. Antennæ lost, except two basal joints. Prothorax light brown with a median longitudinal impression, clothed with long, fuscous hairs. Meso- and metathorax

fuscous, the former with stout fuscous hairs, the latter with long and weak gray hairs. Underside of thorax mostly brownish. Legs brownish, tibiæ and all the tarsal joints fuscous; spurs on tibiæ 2, 4, 4; hind femora somewhat dark, with a brown ring near the extremity. Fore wing light fuscous yellow, with fuscous markings, as shown in figure, with some stout blackish hairs at the base;

Fig. 13.—*Neuronia reginella* n.sp (Male).

Fig. 14.—*Neuronia reginella* (Male), genitalia, dorsal view.

veins yellowish. Inner half of hind wing violet black, forming a broad, beautiful orange band between this and the fuscous black apical spot. Abdominal segments blackish, fuscous on both dorsal and ventral sides, each segment with hind margin narrowly brown. Suranal plate in the genitalia of male individuals rather broad and little produced in its hind margin; superior appendage, with two small projections and many hairs on the end; intermediate one separated at the end of a small lobe curving little upward; inferior claspers stout and long, suddenly becoming much more slender near its end.

Length of body 20 mm.; length of fore wing 33 mm.; length of hind wing 28 mm.

The type is a single male specimen in the collection of the Imperial Agricultural Experiment Station at Nishigahara. The specimen was captured by Mr. Murata at Nikko, on July 28th.

This species is closely allied to *Neuronia regina*, which is a little larger, but the differences in the genitalia, mouth parts and wing markings seem to me to warrant the specific separation of the two forms.

3. *Neuronia clathrata* Kolenati.

*Anobolia* (*Oligostomis*) *clathrata* Kolenati, Gen. et spec. Trichoptera, i. p. 82 (1848).

*Neuronia clathrata* Walker—Cat. Neuropt, Brit. Mus., Pt. I, p. 7 (1852); Matsumura, Journ. Coll. Agr. Tohoku Imp. Univ., IV, p. 16 (1911).

4. *Neuronia phalænoides* Linné.

*Phryganea phalænoides* Linné—Faun. Suec., p. 378 (1761).

*Holostomis phalænoides* Walker—Cat. Neuropt. Brit. Mus., Pt. I, p. 6 (1852).

*Neuronia phalænoides* Matsumura—Journ. Coll. Agr. Tohoku Imp. Univ., IV, p. 15 (1911).

The above two species occur in Europe and Siberia, and have been described by Matsumura (l. c.) from Saghalien. It is said that a few specimens have been obtained at Solowiyofka, Chipsani and Galkinowraskee, on that island. No specimen before me.

5. *Neuronia apicalis* Matsumura.

*Neuronia apicalis* Matsumura—Thous. Ins. Jap., I, p. 172, Pl. XII, fig. 11 (1904); Matsumura—Journ. Coll. Agr. Tohoku, Imp. Univ., IV, p. 15-16 (1911).

6. *Neuronia fluvipes* Matsumura.

*Neuronia fluvipes* Matsumura—Thous. Ins. Jap., I, p. 172, Pl. XII, fig. 12 (1904).

Unfortunately, neither *N. apicalis* nor *N. fluvipes*, both of which were described by Matsumura about ten years ago from Hokkaido and Honto, are represented in the material before me. The same professor recorded the former from Saghalien, also.

7. *Neuronia melaleuca* MacLachlan.

*Phryganea melaleuca* MacLachlan—Journ. Linn. Soc. Lond., Zool., XI, p. 106 (1871).

*Holostomis melaleuca* Matsumura—Thous. Ins. Jap., I, p. 166, Pl. XII, fig. 2, ♀ (1904).

*Neuronia melaleuca* Ulmer—Doutch. Ent. Zeit., p. 339 (1908).

The specimens in hand, which I believe to be true *N. melaleuca*, differ to a certain extent from that species as described and figured by Matsumura in his "Nippon-Senchu-Zukai" (Thousand Insects of Japan), though the too meagre description does not enable me to satisfactorily determine it. It may be doubted whether Matsumura's identification of his specimen with *N. melaleuca* be justified.

In any case it may safely be said that there is another form in Japan besides *N. melaleuca*, closely allied to this species. It is said that the habits of this species resemble those of *N. regina*.

*Habitat*—Hokkaido, Honto.

Genus *Phryganea* Linne.

8. *Phryganea japonica* MacLachlan.

*Phryganea japonica* MacLachlan—Trans. Ent. Soc. Lond., (3) V, p. 248 (1866); Matsumura—Thous. Ins. Jap., I, p. 167, Pl. XII, fig. 3, ♂ (1904); Ulmer—Cat. Coll. Selys, Fasc. VI (1), p. 10, figs. 11, 12 and 13, Pl. I, fig. 2 (1907); Ulmer—Gen. Insect., Pl. XXX, fig. 1 (1907).

The markings of the fore wing of this species are subject to variation, and the material before me can be separated into two types:

(i) Those that have conspicuous fuscous lines along the cubital and the fourth apical veins.

(ii) Those that have faint and obscure fuscous lines along the cubital and the fourth apical veins.

Though there are some other minute differences in the markings of the fore wing between types i and ii, I think they are not worthy of specific rank, since I could not recognize any difference in the genitalia, nor in any other respects, that appear to be specific. Until a more comprehensive study of these two forms is published I shall have to include them in one species, *Phryganea japonica*. It would be very interesting if their life-histories were known.

It seems to me that Ulmer's figure in the Selys Catalogue represents type i and his figure in Genera Insectorum type ii Matsumura's figure seems to represent type i.

This is one of the most common caddisflies of the family in the Main Island of Japan, occurring also in Hokkaido.

9. *Phryganea sordida* MacLachlan.

*Phryganea sordida* MacLachlan—Journ. Linn. Soc. Lond., Zool., XI, p. 106 (1871); Ulmer—Cat. Coll. Selys, Fasc.VI (1), p. 8, figs. 6-10 (1907).

A single female specimen in the collection of the Imperial Agricultural Experiments Station, from Gifu, labeled "Hayafumiyama."

10. *Phryganea latipennis* Banks.

*Phryganea latipennis* Banks—Proc. Ent. Soc., Wash., VII, p. 107 (1906); Ulmer—Cat. Coll. Selys, Fasc. VI (1), p. 10, figs. 14-20, Pl. I, fig.3 (1907).

A single male specimen in the collection of the Agricultural Experiments Station from Gifu, where the type specimen of this species was obtained.

The above two species seem to be uncommon.

Genus *Limnoceutropus* Ulmer.

11. *Limnoceutropus insolitus* Ulmer.

*Limnoceutropus insolitus* Ulmer—Cat. Coll. Selys, Fasc. VI (1), p. 14, figs. 21-23 (1907).

This is the single species of the genus *Limnoceutropus*, and is known only from the female. I have not seen specimens of it.

Taken at "Nikko, 600-2000 m."

Komagome-Higashikatamachi, Tokyo, Japan.

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## THE OCCURRENCE OF THE MYMARID GENUS *COSMOCOMOIDEA* HOWARD IN AUSTRALIA (*HYMENOPTERA*).

BY A. A. GIRAULT, NELSON, N. Q., AUSTRALIA.

The following remarkable mymarid represents the fifteenth genus of the group known to occur in Australia. The original description of the genus is not accessible to me just at present, but I should call attention to the fact that the tarsi are *five-jointed*, not as in *Polynema*, as the name would lead one to infer. I have a specimen of the type of the genus, one of the series on which the species was founded, but not a type.

*Genus Cosmocomoidea* Howard.

1. *Cosmocomoidea renani* new species.

Normal position.

*Female.*—Length 2.00 mm. Large for the family. Shining black, the bullæ of the scape, cephalic legs, trochanters, knees, proximal four tarsal joints and tips of tibia, rich brown. Wings conspicuously infuscated at tip (about distal fourth), the proximal

margin of the fuscation convex; slightly distad of the middle, where a rather broad band crosses, not quite its own length from the end of the stigmal vein, and obscurely under the marginal vein. Scape more or less brownish along proximal half. Coxæ black. Venation brown. Posterior wings clear. Head and thorax with a scaly, polygonal reticulation, the propodeum less scaly, smooth and shiny between the median carinæ.

Differs from the type of the genus (*morrilli* Howard) in being black, in having the flagellum uniformly black, the wings more conspicuously and differently fumated, the greater size, and in having joints 4 and 5 of the funicle longest of that region; also, the abdomen is not distinctly petiolate, but only tapers at base—slender there. The following important structural characters are noted: The thorax is rather peculiar, for there is a mesopræscutum present at the meson cephalad of the scutum, and which is moderately large and subquadrate; the pronotum is short at the meson, but dorso-laterally long, extending broadly halfway down the scutum (but not by far to the tegulæ), then curving off; the axillæ are small, but distinct, not advanced into the parapsides and widely separated. Scutellum subquadrate, as long as the scutum, the latter with a median grooved line. Parapsidal furrows complete, short, curved, the parapsides short and wedge-shaped, with the base of the wedge mesad. Propodeum with a carina on each side of the meson, the two rather widely separated; the spiracle minute and round, near postscutellar margin. Tarsi 5-jointed. Ovipositor not exserted.

(From one specimen, 2/3-inch objective, 1-inch optic, Bausch and Lomb.)

*Male.*—Not known.

Described from a single female specimen captured by sweeping grass and foliage in a forest at Nelson, N. Q., December 13, 1912 (A. P. Dodd). Other specimens were captured a few weeks later in the same place.

*Habitat.*—Australia, Nelson (Cairns), Queensland.

*Type.*—In the Queensland Museum, Brisbane, the above female in xylol-balsam.

[Dedicated to Ernest Renan.]

# NEW SPECIES AND NEW LIFE HISTORIES OF EPHEMERIDÆ OR MAYFLIES.

BY WILBERT A CLEMENS, TORONTO, ONT.

(Continued from page 262.)

Subfamily—*Heptageninæ.*

*Ecdyurus maculipennis* Walsh. (Pl. VI, fig. 4, Nymph.)

Only a few imagos of this species were taken, although the nymphs were abundant along open stony shores and in rapids. My collections of nymphs date from July 2nd to August 23rd, and rearings from July 6th to August 30th.

*Ecdyurus lucidipennis* sp. nov.

This was not a very abundant species, but nymphs were collected July 1st and 14th, and imagos reared July 4th and 17th, respectively.

Male imago:

Measurements—Body 6 mm.; wing 7mm.; fore leg 6.5 mm. Face very slightly obfuscated; dorsal surface of head dark brown or reddish. Notum dark brown; sides of thorax and ventral surface light yellow. Dorsum of abdomen a blackish brown; venter considerably lighter. Penis lobes and bases of forceps yellow; forceps tinged with black. Setæ with basal halves slightly tinged with black and minutely hairy. Fore femora dark, middle and hind yellowish. Wings hyaline; longitudinal veins slightly dusky, especially costa and subcosta; cross-veins entirely colourless.

Female imago:

Measurements—Body 6 mm.; wing 7.5 mm.; fore leg 4 mm. Thorax and abdomen lighter in colour than male.

Nymph: (Pl. VI, fig 5.)

Measurements—Body 7-8 mm.; setæ 3-4 mm. Head brown, with numerous light spots, chief of which are 6 along anterior margin, 2 lateral to each antenna, 4 small, elongated ones between antennæ, and 2 small round spots anterior to these latter. Thorax above lighter brown, with numerous light areas. Anterior part of each abdominal segment brown; four light spots along anterior margin, one large one at each lateral margin, and 3 along posterior margin. Setæ of about equal length and fringed with hairs; middle one slightly smaller in size than lateral ones. Femora flattened,

fringed with spines along anterior margin and with hairs along posterior; rather light in colour, with 2 zigzag brown marks about middle and brown areas at distal and proximal ends. Tibiæ banded about the middle with brown. Tarsi with distal and proximal ends dark.

*Ecdyurus pullus*, sp. nov.*

This is a large form, compared with the two previous species. The nymphs were found along the very stony, exposed shores of small islands three and four miles out in the open bay. The collections are dated June 23rd and July 6th, and the rearings July 2nd. A few imagos were captured June 27th.

Male imago:

Measurements—Body 10-11 mm.; wing 11 mm.; setæ 22 mm.; fore leg 11-12 mm. Face pale, slightly tinged with brown along the carina. Dark brown on dorsal surface of head between eyes. Pronotum dark brown; mesonotum lighter; a dark brown line on each side of prothorax extending forward from base of fore wing; other dark brown marks at bases of wings and legs. Dorsal surface of abdomen dark brown, somewhat lighter laterally toward anterior margin; ventral surface light in colour. Genitalia of the usual *Ecdyurus* type. Legs light in colour, dark at joints. Tarsi of fore legs in order of increasing lengths, 1, 5, 4 (3 and 2) equal. Wings with longitudinal and cross veins brown and very slightly darkened in apical costal region.

Nymph: (Pl. V, fig. 10.)

Measurements—Body 12 mm.; setæ 15 mm. Head brown, with a colourless area on each side from eye to lateral margin of head, and three light dots between eyes; slightly fringed with hairs along anterior and lateral margins, and a light area about the middle of each half of pronotum. Mesonotum darker, with numerous light spots. Each segment of abdomen brown; 1-8 have six light spots, and 4-8 have the two spots near the median line fused, forming a large rectangular area; segment 9 with only four light spots; segment 10 entirely brown. Gills comparatively small, lamellæ oval. Setæ of about equal size, with each two alternate segments brown; sparsely fringed at joints, and outer

*This species was listed on p. 247 as *Ecdyurus grandis*, sp. nov.

margins of lateral ones not fringed. Femora stout and flattened, brown in colour, lighter at distal and proximal ends, and two or three irregular light areas toward middle; covered with minute spines and fringed along posterior margin with hairs. Tibiæ alternately light and dark banded; fringed along both anterior and posterior margins. Tarsi brown, with proximal tips colourless. Ungues double on each leg, the large one well covered, the other small and lateral to the large one.

Subfamily—*Ephemerinæ*.

*Hexagenia bilineata* Say.

This was a very common species at Go-Home Bay. The nymphs were first taken on June 6th, by dredging in water 15 to 45 feet deep. The bottom was very muddy. When the nymphs were placed in jars containing about 4 inches of mud, they immediately began to burrow, and were able to bury themselves in a very short time. At first the gills were left partly exposed, and the position of the nymphs could be detected by the waving motion in the thin mud. Later on they completely buried themselves, and only the round openings of the burrows could be seen. The first of these nymphs to emerge was on July 3rd, and others followed in July and August, while one was still alive in the breeding jar on September 9th, when the Station was closed. On June 13th the first subimago was captured at large, but not till June 28th did imagos appear in large numbers. They would commence their flight shortly after sunset, flying in large swarms about the tree tops. The hum of their wings could be heard up to a distance of 125 feet or more. The females deposited their eggs by flying up and down the shore, brushing off the eggs as they appeared in two small, rather compact columns from the openings of the oviducts, by dipping to the surface of the water. On July 12th a female was caught just after copulation, and she deposited a large number of eggs by being held by the wings and touching her abdomen frequently to some water in a jar. These eggs hatched in thirty-six days.

Nymph: (Pl. VI, fig. 1.)

Measurements—Body 30-35 mm.; setæ 13-15 mm.; antennæ 5-6 mm. Head rather yellowish, with dorsal surface between

ocelli and between eyes entirely brown or in some cases lighter along median line and posterior margin. Antennæ very hairy at joints of basal halves, while apical halves are entirely bare and become very slender. Margin and base of frontal piece hairy. Clumps of hairs between eyes and at bases of antennæ, in front of lateral ocelli and posterior to eyes. Mandibular tusks ¾ length of antennæ, upcurved, brown at tips, and with three longitudinal rows of hairs. Prothorax has a broad longitudinal band of brown on each side of middle line on dorsal surface, and is very hairy along lateral margins. Mesothorax brown for the most part, dorsally. Each abdominal segment has a large, almost triangular brown area with two light areas within it; these light areas often reduced to mere stripes. Ventrally on segments 6 to 8 there is a faint median longitudinal dark streak, while on ninth segment are two lateral streaks. Setæ of about equal length, and very hairy at joinings for entire length. Gills and legs of usual *Hexagenia* type.

*Ephemera simulans* Walker.

The imagos of this species appeared from June 5th to July 27th, but were most abundant during the first two weeks in July. The nymphs were not taken at Go-Home Bay, although diligent search was made. The male imagos would appear shortly before 8 o'clock in the evening, and were often noticed in the morning, also, as late as 10 o'clock. They would dance in swarms of a couple of hundred individuals, usually at a height of from 10 to 35 feet. When a female appeared, several males would take after her. The successful male, flying up beneath the female, would seize her around the prothorax with his long fore legs, and bending up his abdomen would grasp her abdomen with his forceps, and his penis could then be inserted in the oviducts. His setæ usually aided him in securing and maintaining his hold by being bent up over the female's body. The couple would then go off on a gradual downward slant toward the water, before reaching which the male would disengage himself and fly back to the swarm, while the female would fly out over the water and soon begin depositing her eggs by skimming the surface of the water with her abdomen. A peculiar thing was noticed, namely, that the male *Ephemera*

frequently attempted copulation with the male *Hexagenia*, apparently being deceived by the colour.

Subfamily—*Baetinæ*.

*Baetisca obesa* Walsh.

The very interesting nymphs of this species were quite abundant along the north-east shore of Giant's Tomb Island, on May 26th. The shore is rather sandy, with numerous small stones, and deepens very gradually. The nymphs were clinging to the stones in water 3 to 15 inches deep. Imagos did not emerge from this collection until July 13th.

*Leptophlebia* sp. ?

A single almost mature nymph was taken on July 21st in quiet water at the side of an old lumber chute, but it died before time of emergence.

*Blasturus cupidus* Say.

This is an early species, mature nymphs being found May 25th, and subimagos appearing May 31st. A small nymph, collected May 31st, was observed to be filled with small, oval, brownish bodies. Upon dissection by Mr. A. R. Cooper, these were found to be the eggs of a trematode, and in the midst of them was the trematode itself, which belonged to the genus *Halicometra*. Another nymph, taken some time afterwards, was also discovered to be parasitized.

*Blasturus nebulosus* Walker.

The nymphs and imagos of this species were first taken June 9th, on a small, bare, granite island a short distance out in the open bay. On top of this island were numerous pot-holes of all sizes, and in these, under loose pieces of rock and some rubbish the nymphs were very abundant, having tadpoles, chironomid larvæ and water beetles for associates. Many nymphs were covered with *Vorticella*. Several nymphs were observed to crawl out of the water and transform on the rock just above the surface of the water. Subimagos were clinging to the sides of the rock in sheltered places, and a few imagos were flying above the pools. This species was again observed on June 27th, on an island five miles from the

mainland. The island had an area of about three acres, and was almost smooth, bare granite. On top was a pretty lagoon, margined with water plants, shrubs and a few small trees. Imagos of *Blasturus nebulosus* were dancing over this pond in the sunlight, about 3 p.m., matings frequently occurring.

Nymph:

Measurements—Body 9.5-10 mm.; setæ 7-10 mm. General colour blackish brown. Head brown, with a dark area behind middle ocellus and between the lateral ones; black, scroll like markings between the eyes. Pronotum has a small light spot on each side, close to median line and near anterior margin; posterior to this and farther from median line is another larger oval light spot, and lateral to this again is an elongated light area; the rounded lateral margin is colourless. Abdomen is blackish brown, with light brown markings; segments 5 or 6 to 10 have a light median longitudinal stripe; on each segment is a slightly elongated, incurved small light spot on each side of median line toward the anterior margin of the segment; posterior and more lateral is a larger round light area, which usually disappears on segments 8, 9 and 10. Ventral surface is light brown, with three faint dark longitudinal lines, one median and two lateral; on each side of the median line in each segment is a very small white oblique line near anterior margin, and posterior to this is a small light dot. Median seta shorter, slenderer and lighter in colour than lateral ones. All fringed with hairs at joints. Legs light brown; posterior margins of tibiæ and tarsi fringed with hairs, and anterior margins covered with serrated teeth; inner margins of claws with rows of teeth for their entire lengths.

Up to the present time I have not been able to find any apparent differences between the nymphs of these two species of *Blasturus*.

*Choroterpes* (*?*) *basalis* Banks.

Large numbers of the nymphs of this species were found in a small stream July 30th, clinging to the lower sides of stones in the quiet water. The next day several subimagos emerged from this

collection. As late as September 5th mature nymphs could be found here.

*Ephemerella lutulenta* sp. nov.

Male imago:

Measurements—Body 8-9 mm.; wing 10 mm.; setæ 12-14 mm.; fore leg 8 mm. Face dark brown; a spotted reddish-gray streak down carina, and two similar lateral streaks from it to the bases of antennæ. Thorax dark reddish brown. Abdomen blackish brown; segments 9 and 10 slightly lighter in colour; venter pale; posterior lateral margins of 9th segment produced into spines. Forceps pale, with tips brown. Setæ reddish brown toward bases, but becoming pale toward tips; articulations brown. Legs greenish yellow, claws brown. Segments of fore tarsi in order of increasing lengths, 1. 5, 4, 3, 2; 1 very small; fore femur about five-sixths length of fore tibia. Wings entirely clear.

Female imago:

Measurements—Body 9-10 mm.; wing 10 mm.; setæ 10-12 mm.; fore leg 5 mm. Quite similar to male. Posterior lateral projection of 9th abdominal segment not as long as in male.

Nymph:

Measurements—Body 10-11 mm.; setæ 6-7 mm. A large species, with colour varying from a dirty brown to a deep blackish brown, often of a granular appearance. Body and legs hairy. Head with a pair of occipital tubercles of varying size; in the male these are often obscured by the developing eyes of the imago. Pronotum rectangular. Abdominal segments 2-9 produced laterally into flat spines; none on segment 1, minute on 2, increasing in size to the 9th, none on the 10th. A double row of spines on dorsal surface, very minute on segments 8-10, large on 1-7. On venter, six small black dots on each segment, sometimes very faint. Rudimentary gills on segment 1; gills on segments 4-7, covered by a large jointed elytroid gill cover 1.5 mm. in length. Femora stout, brown in colour, with numerous round white dots and several irregular light areas. Tibiæ with median brown band, distal ends light, proximal ends dark. Tarsi about same length as tibiæ, and with proximal half dark and distal half light. Claw with numerous

pectinations. Setæ well fringed with hairs along middle, almost bare at base and tip; each two alternate segments brown.

The nymphs were taken almost everywhere about Go-Home Bay from May 29th to June 19th, in quiet water. Mr. R. P. Wodehouse gave me specimens from various places around Georgian Bay, including Shawanaga Bay, Penticost Island, French River and Sturgeon Bay.

*Ephemerella lineata* sp. nov.

Female imago:

Measurements—Body 9 mm.; setæ 14 mm.; wing 10.5 mm. Very similar to female of *E. lutulenta*, but has a rusty brown median longitudinal stripe on dorsal surface of abdomen. In a fresh specimen the stripe would probably extend over the thorax, and thus correspond to the stripe of the nymph. No male specimens were reared.

Nymph (Pl. V, fig. II):

Measurements—Body 10 mm.; setæ 6 mm. Slightly smaller than *E. lutulenta*, but very similar in colour, except that there is a dorsal median longitudinal white stripe from the anterior margin of the pronotum to the posterior margin of the 10th abdominal segment. This stripe lies between the double row of spines on the abdomen. Occipital tubercles slightly longer than those of preceding species.

The nymphs were not very abundant, but were found in about the same localities as *E. lutulenta*, from June 3rd to July 9th. My bred specimens are dated June 14th and June 15th.

*Ephemerella bicolor* sp. nov.

Male imago:

Measurements—Body 5-6 mm.; wing 6 mm.; setæ 8-9 mm.; fore leg 6 mm. A small brown species, very similar to *E. lutulenta* in form and structure, but very much smaller. The size, apparently, is the only character by which to distinguish it.

Female imago:

Slightly larger than male.

Nymph: (Pl. VI, fig. 3.)

Measurements—Body 6-6.5 mm.; setæ 3 mm. These nymphs show a great variation in colour pattern. The light-coloured

specimens are of a dirty white colour, with brown markings. Head for the most part brown, slightly paler towards posterior margin. Pronotum brown laterally; anterior margin of mesonotum brown, and a brown area at posterior margin between the wing pads. Anterior halves of abdominal segments 2 and 3 brown, and slight marks on the 4th segment; brown areas on 6 and 7 about the median line, and on segment 9 there are two small brown dots at anterior margin, and a rather semicircular brown band posteriorly. Some specimens are almost entirely brown, and between these two extremes the amount of brown and white varies. Many specimens, especially females, show slight indications of tubercles on the head, but they are never large, as in the preceding species. A double row of spines on abdominal segments 1-7; postero-lateral margins of segments 3-9 produced into broad, flat spines. Gills on segments 4-7 covered by a large jointed elytra. Setæ light brown basally, becoming paler distally; well fringed with hairs; joints brown. Legs rather small; femora stout; colour for the most part brown, divided into two areas, the proximal one large and contains a rectangular white spot, the distal one smaller and contains a perfectly round white dot. Tibiæ brown at proximal end and a brown band near distal end. Tarsi with a brown band toward proximal end. Claws dark and pectinated.

The nymphs were everywhere abundant, in exposed as well as sheltered places. Imagos were captured and reared from July 1st to July 12th.

Genus *Drunella* Needham.

Several nymphs of this genus were taken, but no imagos were reared.

*Cænis diminuta* Walker.

This little nocturnal species came to the lamp in the reading-room for the first time on July 2nd, and was taken as late as August 12th. The nymphs were common in ponds and lagoons from June 5th to July 30th.

*Tricorythus allectus* Needham.

Imagos were captured on July 3rd and 9th, but none were reared. Nymphs which apparently belong to this species were

dredged up from a slightly sandy bottom in water 5 to 15 feet deep, on September 3rd.

*Chirotenetes albomanicatus* Needham.

On July 16th I found a nymph slough at Sandy Gray Falls, on the Go-Home River, but was unable to find either nymphs or imagos. I did not get up to the falls again until August 23rd, and then found the numerous small nymphs of the next generation.

*Siphlurus flexus* sp. nov.

Two beautiful *Siphlurus* nymphs were taken early in the season, but both died before time of emergence. The first was found May 25th in the bottom of a canoe, when some water was being emptied from it; the other was found June 3rd beneath a stone in about 1½ feet of water along the open, exposed shore of Station Island. Quite a number of imagos, apparently *Siphlurus*, were captured about this time, and it seemed quite probable that they were the same species as the nymphs. I think I have proved this quite conclusively by the wing venation. The wing of the imago has a very characteristic bend in cubitus 2 at the base, and the wing pad of the nymph shows this bend very distinctly. Again, the imago has claws like *Ameletus*, the two on each leg being unlike. These two unlike claws can be made out in one of the nymphs, due to the nymph dying just when about to transform. Imagos were captured on May 23rd, May 26th, and June 12th. On the latter date a swarm of 12 or 15 were observed flying off the west point of Station Island, about 5.30 p.m., at a distance of from 12 to 20 feet from the surface of the water. They faced the west, and had the characteristic fluttering rise and leisurely fall.

Male imago: (Pl. VI, figs. 10, 11.)

Measurements—Body 13-14 mm.; wing 12-13 mm.; setæ 23-24; fore leg 12-13. Head blackish brown, except lower part of face, which is tinged with brown; eyes large, meeting dorsally. Notum blackish brown. Sides of thorax marked irregularly with white. Abdominal segments 1, 8, 9 and 10 dark, segments 2-6 lighter in colour; these latter are light toward anterior margin and brown toward posterior; in the median line the brown is dark and forms a triangular area, the apex extending almost to the anterior margin; from the anterior margin in the median line two bands arise, com-

posed of black dots, passing backwards, curving outward, end near the base of the triangular brown area; between this line and the triangular area is a light brown oval area; segments 7-10 almost entirely blackish brown dorsally, but 7 and 8 have triangular white areas on sides, and 9 a slight indication only; segment 10 has the sides of dorsum white. Ventrally segment 1 is dark brown, and remainder white with brown markings; segment 2 has two brown spots; 3 with two smaller brown spots and a slightly reddish area at anterior margin in median line; on 4 and 5 the brown spots become smaller and the reddish areas larger; on segment 6 the reddish area is elongated to the posterior margin; on 7 and 8 there is a median longitudinal brown line, thickened about the middle, and two dots of unequal sizes on each side of it; segment 10 brown, except for a lateral white streak on each side. Forceps white and 4-jointed. Setæ white, with brown joints, and minutely pubescent. Fore legs brown; femur with a light area near distal end, next to which is a dark brown band; tarsal joints 1, 2 and 3 about equal in length, 4 slightly shorter, and 5 about half the length of 4th. Hind legs lighter in colour than fore; a brown band on femur in distal half; tibia with a brown band about middle; tarsus light in colour, but brown at joints; joint between tibia and tarsus 1 not distinct. Claws unlike. Wings with brown neuration; costal cross veins and others toward base of wing margined more or less with brown; a slight brown cloud in apical costal area; a heavy brown cloud at bulla; often a small cloud at bifurcation of median vein; cubitus 2 strongly bent at base; hind wing with a large brown cloud at base.

Female imago:

Quite similar to male.

Nymph: (Pl. VI. figs. 8, 9.)

Measurements—Body 15 mm.; setæ 5 mm. The two nymphs collected proved to be a male and female, both mature, but, unfortunately, both died when just about to transform. On this account it is difficult to describe the colour pattern, as the body of the subimago shows through the nymph skin.

Head vertical; body curved. Posterior lateral margins of abdominal segments 1-9 produced into spines. Dorsal colour pattern

distinct on segments 9 and 10 only; 9th pale with a short median longitudinal brown stripe commencing at anterior margin; on each side of this is a short stripe of about same length, but placed more posteriorly; lateral to this, again, is a large brown area, roughly triangular, apex at posterior margin, base at anterior; at lateral margin, slightly below middle line, is a small brown spot; on the 10th segment is a median brown longitudinal stripe, with two dots on each side of it. Ventral surface of abdomen white, with three longitudinal brown stripes, one median and two lateral. Gills on segments 1-7, double on 1, 2 and 3. Three setæ of equal length; lateral ones fringed with hairs on inner margins only, except tips; all banded toward distal end with brown. Legs pale; femur with proximal end brown and a brown band beyond middle; tibia with a brown band about the middle; tarsus with brown band toward proximal end; fore tarsus much longer than fore tibia; hind tarsi only slightly longer than hind tibiæ; fore claw rather short, broad and bifid at tip; hind claws about twice length of fore, and very pointed.

*Baetis propinquus* Walsh.

The imago is described in Eaton's Monograph, but my specimens do not show the subopaque area between the two nervures of the hind wing. Nymphs were taken at Go-Home Bay from June 14th to July 22nd; on August 19th large numbers of them were discovered in a little bay of a small, bare island about three miles out in the open. This rock was the home of numerous gulls, and hence is commonly called "Rookery" Island. The nymphs were mature, and imagos emerged on August 21st and 22nd.

Nymph: (Pl. VI, fig. 6.)

Measurement—Body 6 mm.; setæ 2 mm. Face vertical, mostly brown in colour; on dorsal surface of head on each side of median line is a row of irregularly-shaped light spots. Notum brown with various light areas. Dorsum of abdomen for the most part brown; segments 2-4 brown, with a light area in each half of each segment, and margins colourless; on segment 4 there is also a light area in median line; segment 5 quite light in colour; segment 6 brown, with a light area along anterior margin and two faint ones posterior to it; segments 7 and 8 each with two rather large pale areas in posterior half; segment 9 almost entirely pale; segment 10

slightly brown, especially along posterior margin; on each of the brown segments there are two small faint pale oblique, slightly-curved streaks, and a pale dot posterior to each. Ventrally, the joining of segments brown. Setæ slightly tinged with brown, with tips darker brown and a brown band beyond the middle; lateral setæ fringed on inner sides only. Legs pale; femora banded with brown about middle; tibiæ and tarsi darker toward distal ends; each claw with a lateral row of sectinations.

*Cloeon dubium* Walsh.

The imagos I have agree with the description in Eaton, except that the intercalar veins are single, not in pairs. Adults were numerous at Station Island about July 10th, flying in small swarms along the shore at a height of from 10 to 15 feet. They appeared about 7.45 in the evening. Not many nymphs were taken, collections dating July 30th to August 12th. Imagos were reared July 30th and August 2nd.

Nymph: (Pl. VI, fig. 7).

Measurements—Body 4-4.5 mm.; setæ 1.5 mm. Face vertical, with two large pale areas above antennæ; between eyes a large pale area, partly divided into two parts, and containing two brown stripes. Notum brown, with irregular light areas. Dorsum of abdomen brown, except lateral margins, which are colourless; on each segment there are two small, oblique, pale streaks and two round dots posterior to the streaks. Setæ pale, with brown band toward distal end; lateral setæ fringed on inner sides only. Gills double apparently on segments 1 and 2 only; broader than gills of *Bætis*; a main trachea in each slightly to outer side, and branchlets on inner side only. Legs pale; femora banded with brown in distal half; tibiæ and tarsi brown toward proximal ends; claws comparatively long, sharp-pointed, not pectinated.

*Callibætis ferruginea* Walsh.

Imagos, subimagos and nymph skins of this species were collected in Toronto by Dr. E. M. Walker, who kindly handed them over to me. The date would be about August 20th. None were taken at Go-Home Bay.

I am very grateful to Dr. Anna H. Morgan, Mount Holyoke College, So. Hadley, Mass., for the identification of a number of species for me.

## *VANESSA CALIFORNICA* AGAIN.

BY F. M. WEBSTER, WASHINGTON, D. C.

I note with interest the criticism of Dr. J. McDunnough of Decatur, Illonois, in the July Number of the Canadian Entomologist, on my note in the preceding April number relating to the above-named species.

The trouble seems to be that Dr. McDunnough is looking at the matter solely from the viewpoint of what the writers of the letters, quoted by me, claimed to have seen, while I used these letters in their entirety, together with the identifications as they came to me, for the purpose of complete record, not only with the object of showing what these people stated that they saw, but also what they actually "produced in court," thus the better enabling everyone to draw his own conclusions from all of the evidence presented.

The problem of the exact larval food habits of the species is not susceptible of solution, either in Washington, D. C., or in Decatur, Illinois.

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## A PARASITE OF THE CHINCH BUG EGG.*

BY JAMES W. MCCOLLOCH,
Assistant Entomologist, Kansas State Agricultural College and Experiment Station.

In the experiments conducted this year to determine the time of the first appearance of young chinch bugs and the mortality of the eggs, a large number of eggs were collected in the field for examination. The eggs, which were collected at different intervals and in different localities, were examined daily. While thus examining the eggs it was noticed that some of them became dark in colour instead of assuming the usual red colouring. These eggs were isolated, and on May 19 there emerged from them three parasites. With these three parasites as a basis, the life-history was carried through four generations, running up to July 5. Since this was the first time between the two broods of the chinch bug,

*Mr. A. B. Gahan, Entomological Assistant of the Bureau of Entomology, U. S. Dept. of Agric., to whom specimens of the parasite were sent for determination, says: "I have made a partial examination of these parasites, and find them to belong to the family *Proctotrypidæ*, and they probably fell close to the genus *Telenomus*. It will require further study for me to determine definitely regarding them. It seems probable that they represent not only a new species, but possibly a new genus."

it became impossible to obtain additional chinch bug eggs with which to continue the work. From July 5 to July 23 only an occasional parasitized egg was found in the field, but beginning with the latter date, parasitized eggs were found in large numbers in the cornfields, and the second generation was obtained by August 10. Up to the present date this year over 275 individual parasites have been bred out. The length of the life cycle has been found to vary from ten to eighteen days, depending on the climatic conditions.

The parasite has been found in every wheat- and cornfield examined around Manhattan. Of 3,101 eggs collected between April 28 and June 10, the average per cent. of parasitism was 20.8, and of 116 eggs collected at Crawford (Central Kansas), 19 eggs, or 16.3, were parasitized.

The work is still under way, and a full description of the parasite, together with notes on its life-history and efficiency, will be published later.

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## A NEW SPECIES OF PHENGODES FROM CALIFORNIA (COLEOPTERA).

BY HERBERT S. BARBER, BUREAU OF ENTOMOLOGY, WASHINGTON, D.C.

With regret the writer feels forced to offer the description of the following species in advance of its publication in a monographic revision of the Phengodids now in manuscript, the appearance of which has been delayed far beyond contemplation.

*Phengodes bellus*, n. sp.

Large, strongly bicoloured. Antennæ (except two basal joints), palpi, elytra and dorsum of last two abdominal segments (except lateral margin) black; wings creamy white; all other parts luteous.

Length 20 mm.; width across humeri 3.8 mm. Habitat, California.

Occiput coarsely strigose; eyes separated above by slightly more than twice the width of one eye as seen from above, below by about one and one-fourth times the width of one eye as seen

from below. Antennæ extending to about third abdominal segment, black, except two basal joints, which are luteous; rami about ten times as long as supporting joint, black with pale hairs. Maxillary palpi black, last three joints subequal (the penultimate slightly shorter), apex of terminal joint very obliquely truncate. Mandibles strong, upper side nearly flat. Under side of head sparsely pubescent, the hairs arising from moderately fine, strigose punctures; gular suture very strong anteriorly, fossa elongate, very narrow, nearly closed. Pronotum half as long as wide, as wide as body at humeri; disc smooth, shining, very minutely punctulate, with small impression before scutellum; sides broadly explanate, the dilated margins each about one-eighth of the entire width, base almost straight, feebly trisinuate; hind angles rounded; side margins straight, very slightly convergent anteriorly; front angles obtuse, broadly rounded; front margin strongly arcuate at middle, nearly straight on each side. Elytra black, one-third longer than width across humeri, feebly bicostate, surface shining, scabrose, punctulate, with fine dark brown pubescence, apices attenuate strongly divergent. Wings creamy white, costa and media brown, other veins pale, a cross-vein between the forks of the cubitus. Abdomen pale, except large black spot on dorsum of last three segments. Legs pale, except tarsi, which are black with dark pubescence, fourth tarsal joint with an elongate, whitish membranous lobe projecting under base of fifth joint; claws with very obtuse tooth at base on inner edge.

Type in the Carnegie Museum. Paratype, No. 16332, U. S. National Museum.

Two specimens collected in June or early July, 1904, by the late Dr. W. Miller, in San Bernardino Co., Cal. (exact locality unknown), and kindly loaned to the writer by Mr. H. G. Klages, who has generously placed the paratype in the U.S. National Collection. This is certainly the handsomest species of the genus known in our fauna. It is distinguished from any other species in the United States by the black elytra and whitish wings. A variety (?) of *P. bipennifera* Gorh. is figured in the Biologia Centrali-Americana as having black elytra but specimens have not been seen by the writer.

## A WORM THAT CARES.

BY XIMENA MCGLASHAN, TRUCKEE, CALIFORNIA.

Does the worm have care or thought for the adult it is to produce? Many writers assert that there are no signs of sentiment in any of the stages of moth or butterfly existence. They say the mother fly lays her eggs because of natural law, the eggs hatch because they must, the larvæ simply live to eat, and the chrysalis, however wonderful, is only a part of the process. That is all very interesting, but the mother never sees nor cares for her progeny, nor does the offspring care for anything but itself. If one were to cross pens in a friendly tilt with these writers, the best illustrations of loving care would doubtless be sought in the pains and trouble which the mother fly manifests in depositing her eggs, or in the solicitude of the larva for the protection of its pupa.

In my home at Truckee, California, there is a species of *Cossus*, which Barnes and McDunnough say is "probably *Cossus angrezi* Bailey," which lays its eggs under the bark and in the wood of the cotton-wood tree in August. The female will oviposit if confined in a paper bag, and lays more than a hundred eggs; but, if allowed to have her own way, she hides each egg in the wood or bark of the tree. The larvæ burrow into the interior of the trunk, and up to the time when they wish to pupate they are entirely hidden from view. They pupate in the bottom of their burrow, and if they only plan for themselves there would seem to be no reason why they should delay the transformation when the time arrives. As a matter of fact, however, they seem to know that the adult must have access to the open air which they themselves have never breathed. Just before pupation they carry their burrow to the surface and smooth the jagged ends of the bark and wood of the opening so that nothing will retard the egress of the moth. They do one thing more which shows a high order of instinct, if it be not reason. The diameter of the opening, just at the surface, is made a trifle less than that of the burrow itself. A little thin ledge projects inward all around the edges of the hole. When the adult is ready to emerge, with the large pupa-case around its body, it arrives at the projecting ledge on the inner side of the opening, and the case itself is a trifle too large to slip through. It is held fast by the ledge while

the adult pulls itself out. When the moth has escaped, bits of the end of the pupa case project outside the burrow, and the empty case may be forcibly extracted before it dries. If this *Cossus* larva pupated in the earth at the foot of the tree there would be a good reason why it should have carried the burrow to the surface. As it does not pupate outside the tree, and as it remains in the open air only long enough to shape and smooth the opening, may we not conclude that here is a worm which cares for its adult?

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## A REMARKABLE NEW PLATYGASTERID GENUS FROM AUSTRALIA.

BY ALAN P. DODD, NELSON, N. Q. AUSTRALIA

*Platygastoides* nov. gen.

*Female* (?). -Head transverse, as wide as the thorax; ocelli far apart, the lateral ones touching the eye margins. Antennæ 10-jointed; scape extraordinarily dilated, scarcely longer than wide, half as wide as the head; when in the normal position the rest of the antennæ lies back along the scape; pedicel slender, twice as long as wide; 1st funicle joint as long as the pedicel and narrower; 2nd as long as wide; 3rd and 4th wider than long; club 4-jointed; 1st joint very short, transverse; club joints 2-4 large, wide.

Thorax short, scarcely longer than wide; pronotum scarcely visible from above; mesonotum wide, with the parapsidal furrows present, wide apart; outside the parapsidal furrows are two parallel groove lines; scutellum semicircular, with a median groove line ; metanotum with two deep sulci, separated by a median carina; lateral edges of the sulci carinate.

Fore wings rather short, broad, without veins. Abdomen sessile, as wide as the thorax, and longer than the head and thorax united; 2nd segment equal to one-half the abdominal length.

Legs rather short; tarsi 5-jointed.

*Type.*—The following species:

*Platygastoides mirabilis* sp. nov.

*Female* (?).—Length, 1.50 mm. Black; legs, except coxæ, reddish yellow; antennæ reddish yellow, the scape and club suf-

fused with black. Head and thorax finely sculptured; abdomen very finely reticulately rugulose. Fore wings infuscated, opaque; marginal cilia very short; discal cilia very fine and dense.

(From 4 specimens, 2-3 inch objective, 1 inch optic, Bausch and Lomb.)

*Male.*—Unknown.

Described from two ♀ specimens caught while sweeping the forest slopes of Mount Pyramid, 1,500-2,500 feet, near Cairns; one ♀ caught while sweeping in a jungle, Goondi (Innisfail), N. Q.; and one ♀ received from the South Australian Museum, and labelled, "Cairns district, N. Q., A. M. Lea."

*Habitat.*—North Queensland (Mount Pyramid, near Cairns, Innisfail).

*Type.*—South Australian Museum, Adelaide, a ♀ tagmounted plus a slide bearing head, antennæ and forewings.

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## STRANGE ACTION OF *BOMBUS OCCIDENTALIS*.

BY J. WM. COCKLE, KASLO, B. C.

Whilst walking across my garden to-day I observed a number of bees disporting themselves on the flowers of some Chinese Cabbage that were running to seed.

On closer inspection I found that they were all *Bombus occidentalis* workers, with the exception of a very few *A. mellifica*. The *Bombus* were there in thousands, and their actions caused me to stop and watch them. Instead of settling and inserting their tongues amongst the pistils of the flower, they tumbled in every direction over the flower, and seemed to be looking for hidden treasure at the base of the corolla. Being unable to see what they were so assiduously hunting for, I sat down in the middle of the patch in order to get a closer observation.

They inserted their tongues in small holes at the base of the corolla and between the folds at the base of the petals. In many cases they seemed to have considerable difficulty in forcing an entrance, raising their bodies and thrusting the tongue down with force.

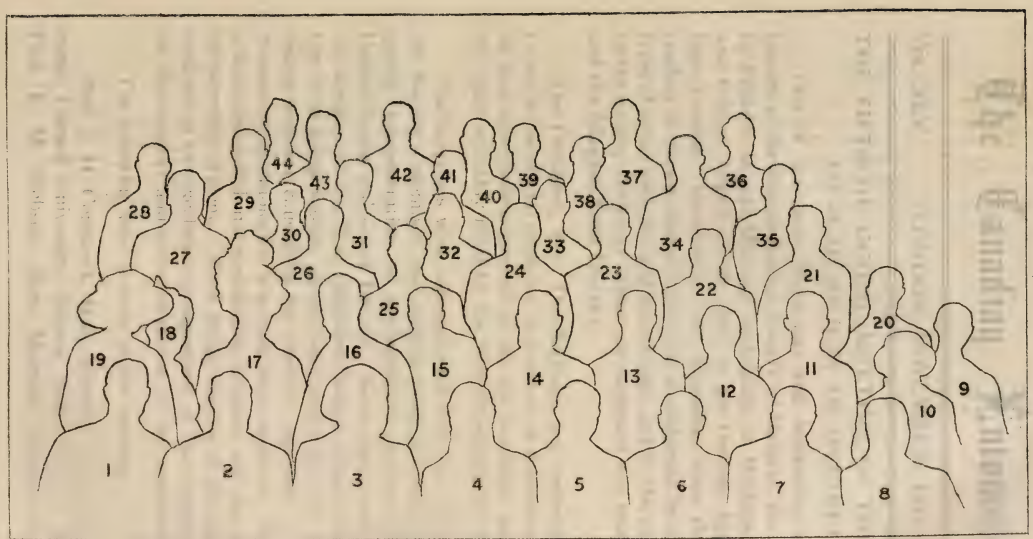
An examination of the flowers showed that all the open flowers were punctured at the top of the bulb which forms the base of the corolla. I made a minute examination of the flowers to find out if the punctures were the work of other insects, but could find no other insect on or in any of the flowers, and also that none of the unopened flower buds showed any sign of puncture. Eventually, by the aid of a glass I found that the puncture was made from the outside and was ragged and torn, and ultimately I was fortunate in seeing one bee actually pierce the base of the corolla whilst I was observing it. As stated before, there were no other bees there except *Apis mellifica*; these were acting in a normal manner, seeking the honey through the centre of the flower, and in no case did I see one attempting to follow the example of the *occidentalis*.

The reason for this (to me, at least) strange action of *B. occidentalis* may possibly be explained by the fact that the tongue of *occidentalis* when fully extended is not nearly long enough to reach the honey sac, but the fact of the folds at the base of the petals being easily pried apart gave them ready access, and it is also probable that when they found a freshly-opened bud on which the folds of the petals had not yet commenced to separate that they found easy access by puncturing the corolla; they most assiduously hunted for a puncture and invariably thrust their tongue into it. Some of the flowers I examined had been punctured in several places. It would be interesting to know if this action of puncture is shared by any of the other bees, or if it is an invariable practice of *occidentalis* when attacking a flower having a deep-seated honey sac.

[NOTE.—*B. occidentalis* belongs to the same group of *Bombus* as the European species *terrestris*, which, it is well known, punctures with its mandibles the base of such flowers as Snapdragon and Broad-bean to obtain the nectar, thereby sometimes damaging the seed vessels. I have seen the workers of *B. terricola*, the representative of this group in Eastern Canada, puncturing the spur of *Impatiens biflora* and sucking the nectar through the wound thus made, though *B. vagans* and *fervidus* were observed obtaining the nectar by entering the flower in the legitimate way.—F. W. L. Sladen, Central Experimental Farm, Ottawa.]

Mailed October 13th, 1913

ENTOMOLOGICAL SOCIETY OF ONTARIO—FIFTIETH ANNUAL MEETING.




1. Prof. W. M. Wheeler. 2. Rev. T. W. Fyles. 3. Mrs. Comstock. 4. Rev. Prof. C. J. S. Bethune. 5. Dr. C. G. Hewitt. 6. Prof. J. H. Comstock. 7. Prof. F. M. Webster. 8. Pres. G. C. Creelman. 9. Prof. T. D. Jarvis. 10. Mrs. Jarvis. 11. Dr. E. P. Felt. 12. Prof. P. J. Parrott. 13. J. F. Brimley. 14. J. D. Evans. 15. G. Meade-Waldo. 16. H. H. Lyman. 17. Mrs. Lyman. 18. Miss Bethune. 19. Mrs. C. G. Hewitt. 20. A. Gibson. 21. F. W. L. Sladen. 22. Dr. R. S. MacDougall. 23. Prof. E. M. Walker. 24. Prof. W. Lochhead. 25. Prof. J. Dearness. 26. Mr. W. E. Saunders. 27. Dr. A. Cosens. 28. Mr. J. J. DeVyver. 29. H. Curran. 30. L. Caesar. 31. R. S. Hamilton. 32. J. C. Chapais. 33. C. E. Petch. 34. R. C. Treherne. 35. Prof. T. J. Headlee. 36. W. A. Ross. 37. A. W. Baker. 38. J. D. Tothill. 39. L. S. McLaine. 40. G. J. Spencer. 41. W. A. Clemens. 42. J. F. Hudson. 43. A. Burrows. 44. G. E. Sanders

The Canadian Entomologist.

Vol. XLV. LONDON, NOVEMBER, 1913 No. 11

## THE FIFTIETH ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

One of the most important and interesting events in the history of the Entomological Society of Ontario, the celebration of its Fiftieth Annual Meeting, took place on Wednesday, Thursday and Friday, August 27-29, 1913, at the Ontario Agricultural College, Guelph. Wednesday and Thursday were devoted to the reading of papers and presentation of addresses by the representatives of other societies and institutions and to the routine business of the society, while on Friday an excursion was made to Grimsby and the Niagara Fruit District.

The President, Rev. Dr. Bethune, was unfortunately unable to act in his official capacity on account of defective eye-sight, but he was nevertheless present at all the meetings, and his place in the chair was ably filled by the Vice-President, Dr. Hewitt.

The meetings were attended not only by a large number of the Society's members and visitors from the town, but also by a goodly representation of distinguished entomologists from the United States and Great Britain. Keen regret was felt by all in the absence of Dr. Wm. Saunders, whose serious illness prevented him from being present, as had been hoped for, but, apart from the disappointment caused by his absence and that of several other prominent entomologists who had been expected, the meeting was a most successful and memorable occasion and was much enjoyed by everyone present. Much of the success of the meeting is to be credited to the excellent arrangements of the committee in charge for the comfort and accommodation of the members and visitors.

The following were present at the meeting:

Prof. J. H. Comstock, Hon. Member, Entomological Department, Cornell University, Ithaca, N.Y.; Mrs. J. H. Comstock; Prof. F. M. Webster, Hon. Member, Bureau of Entomology,

Washington, D.C.; Dr. E. P. Felt, Hon. Member, State Entomologist, Albany, N.Y.; Dr. R. Stewart MacDougall, University of Edinburgh; Mr. Geoffrey Meade-Waldo, British Museum, London, Eng.; Prof. W. M. Wheeler, Harvard University, Cambridge, Mass; Prof. T. J. Headlee, State Entomologist, New Brunswick, N.J.; Prof. A. D. MacGillivray, Urbana, Ill.; Prof. P. J. Parrott, Geneva, N.Y.; Prof. J. J. de Vyver, Entomological Society of N.Y.; Mr. W. A. Clemens, Ithaca, N.Y.; Dr. C. Gordon Hewitt, Dominion Entomologist, Ottawa; Mrs. C. Gordon Hewitt; The Rev. T. W. Fyles, D.C.L., Ottawa; Mr. and Mrs. Henry H. Lyman, Montreal; Prof. W. Lochhead, MacDonald College, P. Q.; Mr. J. C. Chapais, St. Denis (en bas), Quebec; Mr. John D. Evans, Trenton; Ontario ; Mr. F. J. A. Morris, Peterboro ; Dr. E. M. Walker, University of Toronto, Toronto; Mr. J. B. Williams, University Museum, Toronto; Dr. A. Cosens, Parkdale Collegiate Institute, Toronto; Mr. R. S. Hamilton, Galt; Prof. J. Dearness, London, Ont.; Mr. J. F. Brimley, Grimsby, Ont.; Messrs. Arthur Gibson and F. W. L. Sladen, Division of Entomology, Ottawa; the following Field Agents of the Dominion Division of Entomology: Messrs. Sanders, Tothill, Petch, Ross, Hudson, McLaine and R. C. Treherne, Vancouver, B.C.

The Ontario Agricultural College was represented by the following: President Creelman, Prof. C. A. Zavitz, Prof. C. J. S. Bethune, Prof. T. D. Jarvis, Prof. Hutt and Prof. Crow; Mr. L. Caesar, Mr. A. W. Baker, Dr. R. E. Stone, Prof. E. J. Zavitz, Mr. Wright, Mr. G. J. Spencer; Messrs. Burrows, Curran, Good, Hart and others.

On Wednesday evening a meeting of the Council was held in the Biological Lecture Room, at which, among other matters, certain proposed changes in the constitution of the Society were discussed. These changes, which were afterwards adopted at the General Meeting, will be given in full in the December number.

In the afternoon the members and delegates met in the Massey Hall Auditorium, the proceedings commencing with an address of welcome by President Creelman of the College, which was delivered in his usual genial manner and vigorous style. Congratu-

latory addresses were then presented by the following representatives of other societies and institutions:

Prof. E. M. Walker, University of Toronto; Prof. Wm. Lochhead, University of McGill; Dr. C. Gordon Hewitt, University of Manchester, Royal Society of Canada, Academy of National Sciences of Philadelphia and the Canadian Department of Agriculture; Dr. R. Stewart MacDougall, University of Edinburgh and Imperial Bureau of Entomology; Prof. W. M. Wheeler, Harvard University and Boston Society of Natural History; Prof. J. H. Comstock, Cornell University and the Entomological Society of London; Prof. A. D. MacGillivray, Entomological Society of America; Prof. P. J. Parrott, American Association of Economic Entomologists; Dr. E. P. Felt, New York Entomological Society; Prof. F. M. Webster, Entomological Society of Washington and the Bureau of Entomology, U. S. Department Agriculture; Mr. Arthur Gibson, Ottawa Field Naturalists' Club; Mr. J. C. Chapais, Quebec Society for the Protection of Plants; Mr. R. C. Treherne, Entomological Society of British Columbia; Mr. A. F. Winn, Montreal Branch, Ent. Society Ont.; Dr. A. Cosens, Toronto Branch, Ent. Soc. Ont.; Mr. Geoffrey Meade-Waldo, British Museum, Natural History Department, London, England.

A message of congratulation from Dr. William Saunders, who was too ill to be present, was conveyed to the Society by his son, Mr. W. E. Saunders. It was prefaced by a few remarks of appreciation by the Chairman.

Letters of congratulation were also read from the following:

The Imperial Academy of Natural Sciences, St. Petersburg, Russia (by cable); The Vice-Chancellor of the University of Oxford; The Vice-Chancellor of the University of Cambridge; The President, Laval University, Que.; Dr. Walther Horn, Director of the German Entomological Museum, Berlin, Germany; J. P. Moore, Secretary of the Academy of Natural Sciences of Philadelphia; Geo. A. Dean, Kansas State Agricultural College, Manhattan, Kansas; E. Baynes Reed, Dominion Meteorological Station, Victoria, B. C.; N. H. Cowdry, Esq., Chicago; Dr. L. O. Howard, Bureau of Entomology, Washington, D. C.; The University of Chicago, Chicago, Ill.; The Trustees of the British Museum (Na-

tural History), London, Eng.; A. Ross, Sec. Natural History Soc. of Glasgow, Glasgow, Scotland; Guy A. Marshall, Imperial Bureau of Entomology, London, Eng.; Geo. Francis Dow, Secretary, Essex Institute, Salem, Mass.; State Commission of Horticulture, Sacramento, Cal.; Prof. T. D. A. Cockerell, Boulder, Col.; Prof. Harrison Garman, Lexington, Ky. ; Prof. H. F. Wickham, University of Iowa, Iowa City.

Letters expressing regret at their inability to attend the meeting or to send a representative were received from the following: Mr. E. T. Cresson, American Entomological Society, Philadelphia; S. A. Rohwer, Secretary, The Entomological Society of Washington, Washington, D.C.; Prof. H. F. Wickham, State University of Iowa, Iowa City; Prof. Francis John Lewis, Edmonton, Alta, representing the Linnean Society of London, Eng.; Stanley Edwards, Hon. Secretary, South London Entomological and Natural History Society, London, Eng.; Dr. Walcott, Secretary, Smithsonian Institution and the United States National Museum, Washington, D.C.; Louisiana State University, Baton Rouge, La.; The Central Museum, Brooklyn, N.Y.; The Director of the Missouri Botanical Garden, St. Louis, Mo.; Professor V. Kellogg, Leland Stanford University, California; President W. O. Thompson, Ohio State University, Columbus, O.; President Stephen A. Forbes, Director, Ill. State Laboratory of Natural History, Urbana, Ill.; President Robert J. Aley, University of Maine, Orono, Maine; Yale University, New Haven, Conn.; F. J. Skiff, Director, Field Museum of Natural History, Chicago; Dr. L. O. Howard, Director Bureau of Entomology, Washington, D.C.; Professor R. Matheson, Agricultural College, Truro, N.S.; Mr. A. F. Burgess, Secretary American Association of Economic Entomologists, Melrose Highlands, Mass.; Hon. Jas. S. Duff, Minister of Agriculture for Ontario, Toronto; Mr. W. Bert Roadhouse, Deputy Minister of Agriculture for Ontario, Toronto; Dr. C. C. James, Ex-Deputy Minister of Agriculture for Ontario, Toronto; Mr. C. E. Grant, Orillia, Ont.; John Bland, Esq., Secretary, Mo. State Board of Horticulture, Columbia, Mo.; Prof. A. L. Melander, State College of Washington, Pullman, Wash.; The President, University of Montana, Missoula, Montana; Prof. Geo. A. Dean, Kansas State Agricultural College,

Manhattan, Kansas; Joseph H. Kastle, Director, Kentucky Agricultural Experiment Station, Lexington, Ky.; E. Davenport, Director, University of Illinois, Champaign, Ill.; Geo. F. Dow, Secretary, Essex Institute, Salem, Mass.; W. W. Atwood, Secretary Chicago Academy of Sciences, Chicago, Ill.; Harry Piers, Secretary N. S. Institute of Sciences, Halifax; A. F. Winn, Secretary, Montreal Branch of the Entomological Society of Ontario, Montreal; Prof. H. Garman, Agricultural Experiment Station, Lexington, Ky.; Prof. J. G. Needham, Cornell University, Ithaca, N. Y.

The evening was marked by one of the most enjoyable features of the meeting—a reception given to the members by President and Mrs. Creelman at their residence.

On Thursday morning a business meeting was held in the Biological Lecture Room, at which the officers for the ensuing year were elected and several matters of interest to the members were discussed. Of these reference has already been made to the revised constitution of the Society. Among other matters, a resolution was passed recommending that the various entomological societies be properly represented at the International Congress of Entomology. The Rev. Dr. T. W. Fyles was elected a life member of the Society. Mr. J. M. Swaine and Dr. E. M. Walker were appointed to represent the Entomological Society of Ontario on the American Committee of Nomenclature. It was decided to hold the next annual meeting at Toronto, the date to be chosen on a later occasion.

The remainder of the day's session was occupied by the reading of addresses and papers, commencing with the Presidential Address by Dr. Bethune, an extremely interesting review of the Society's early history. An abstract of this address is given below, together with the other papers presented.

The feature of the evening meeting was a most interesting and instructive address on Ants by Prof. W. M. Wheeler, an abstract of which is also given below. The lantern slides, with which the lecture was richly illustrated, were of quite exceptional excellence and beauty.

### Address of President.

The President, Dr. Bethune, stated that, owing to defective eye-sight, he was unable to prepare a formal written address and

would, therefore, endeavour to give some account of the origin of the Society and the proceedings that led to its formation.

When a student at Trinity College, Toronto, he began the collection and study of insects. At that time there were no available books on the subject. The first work that gave him any assistance in naming specimens was Gosse's "Canadian Naturalist," a delightful work giving an account of observations made in various departments of natural history during each month of the year in the eastern townships of the Province of Quebec. In the Canadian Journal there were published excellent short descriptions of the more conspicuous beetles found in the neighbourhood of Toronto by Wm. Couper, a printer by trade. These were supplemented by lists furnished by Prof. Croft, of the University of Toronto. Kirby and Spence's "Entomology" and Westwood's "Modern Classification of Insects" were published about that time and afforded the first scientific aids to the knowledge of insects. Through the kindness of Prof. Croft, the speaker had access to the library of the University of Toronto, which contained several rare works on entomology. He was also permitted to consult the books in the library of Parliament, which, at that time, was located in Toronto. In these libraries he spent much of his leisure time in laboriously transcribing descriptions of Canadian insects, which, for the most part, had to be translated from Latin and French, and also in making copies of illustrations. These difficulties can hardly be realized by students at the present day who have such an abundance of literature upon every department of natural history. Such works as Comstock's "Manual for the Study of Insects" and Mrs. Comstock's "How to Know the Butterflies" would, at that time, have been treasures indeed. However, there is no doubt that the difficulties encountered helped one to build upon a sound foundation and to acquire a more complete knowledge than could be attained by attempting to hastily read a superabundance of publications.

At the suggestion of Prof. Croft, the speaker made the acquaintance of Mr. Wm. Saunders, of London, who carried on at the time the business of chemist and druggist on a moderate scale. The acquaintance thus formed soon ripened into a mutual friendship and esteem which has continued unbroken to the present time.

In the Canadian Naturalist for June 1862 there appeared a list of persons residing in Canada, all interested in the collection and study of insects, which contained no less than thirty-six names. This was prepared by the speaker, with the assistance of Mr. Saunders. It was then proposed that a meeting should be held for the purpose of bringing together as many as possible of those interested, and to form some kind of club or society which would be of general benefit to those concerned. The result of this publication was the holding of a meeting in Toronto at the residence of Prof. Croft in September, 1862. As there were only ten persons present, it was thought inadvisable to form a society at that time, but a draft of a constitution was drawn up and it was decided to hold another meeting during the coming year. On the 16th of April, 1863, a meeting was held in the library of the Canadian Institute and the formation of the Entomological Society of Canada was then decided upon and its constitution drawn up and adopted. The attendance was small, but several who were unable to be present had given in their adhesion to the movement. Dr. Henry Croft, Professor of Chemistry in the University of Toronto, was elected President; Mr. Saunders, of London, Secretary-Treasurer, and the Rev. Jas. Hubbert, Curator. The others present were: The Rev. Wm. Hincks, Professor of Botany and Zoology at the University of Toronto; Dr. Sangster, Principal of the Normal School, Toronto; Dr. Beverley R. Morris, an Englishman who not long after returned to England and there became editor of a popular magazine on natural history, Dr. Cowdry and his son, Mr. N. H. Cowdry, of York Mills, and Messrs. Saunders and Bethune. The following gentlemen were unable to be present, but became original members of the society: Mr. E. Baynes Reed, Barrister, London; Mr. E. Billings, editor of the Canadian Naturalist and Geologist, for many years attached to the Geological Survey. Mr. R. V. Rogers, Barrister, Kingston; Mr. T. Reynolds, Engineer of the Great Western Railway, now part of the Grand Trunk system, Hamilton; Mr. B. Billings, Prescott, who subsequently lived in the neighborhood of Ottawa and formed a large collection of Coleoptera; Rev. V. Clementi, Peterborough, an English Church clergyman, who was greatly interested in the various aspects of

natural history. Mr. Wm. Saunders was appointed by the Dominion Government in 1886 to establish and superintend a series of Experimental Farms extending from Nova Scotia to British Columbia. For twenty-five years Dr. Saunders conducted this work in a most able and successful manner, and his name is well known not only throughout Canada, but also in the United States and Great Britain.

The Society thus formed began its career of active usefulness and it has steadily grown and prospered to the present time. In 1868 the publication of the Canadian Entomologist was begun, the first number consisting of only eight pages. It is now in its 45th year of publication and is sent to all parts of the world. In 1870 the first Annual Report of the Society on Noxious, Beneficial and other Insects was published, the three contributors being Dr. Saunders, Mr. Baynes Reed and the speaker. What really made the fortunes of the Society was the invasion of Ontario by the Colorado Potato Beetle. The Board of Agriculture for the Province requested the Society to report on the insect and to advise as to the best methods of checking or controlling its ravages. An admirable report was prepared by Messrs. Saunders and Reed, the former being a practical chemist was able to experiment with various poisons and to discover that Paris green was the most convenient and reliable substance for the destruction of the beetle. The result of this report was a grant from the Department of $100 per annum, which was afterwards increased to $1,000 and the incorporation of the Society under the name of the Entomological Society of Ontario. For a few years the Canadian Institute in Toronto gave the Society the privilege of using its library and museum for its meetings and collections. After a few years, however, the headquarters were removed to London and continued there until 1906, when a change was made to the Ontario Agricultural College, Guelph.

The speaker expressed the great pleasure which it gave him and his colleagues to find that so many friends had come from long distances to join in the celebration of the Jubilee Meeting of the Society. He joined in giving them all the most hearty welcome and expressed his hope that they would fully enjoy their visit.

# GREEN LANES AND BYWAYS.

BY REV. THOMAS W. FYLES, D.C.L., OTTAWA.

## I.

### Old Country Lanes.

*"Through the green lanes of England, a long summer day,*
*When we wandered at will in our youth's merry May;*
*When we gathered the blooms o'er the hedge-rows that hung,*
*Or mocked the sweet song that the nightingale sung.*

*In the autumn we knew where the blackberries grew,*
*And the shy hazel-nuts hidden deep in the shade;*
*And with shouting and cheer, when the Christmas drew near,*
*In search of the ripe ruddy holly we stray'd."*

These lines appeared in the "Illustrated London News" for January the 24th, 1852. They are dear to my remembrance, for they were sung to me by a much-loved companion—long gone to his rest—as we strolled along an English lane, one day in the summer, after their appearance. From this friend* I received my first lessons in Entomology.

The enclosures in the rural parts of England, by which the road-ways pass, have been from times immemorial, and for the most part they are known each by its proper name, as "Nether lea," "Ea-side," "Haly-well Croft," Twenty acres," "Basket lot," etc. The boundaries of the fields are quickset hedges, with ditches on the outer sides. Six feet from the roots of a hedge was allowed for the ditch.

The original growth of the hedges was Hawthorn (*Crataegus oxycantha* L), but, as time passed on, birds and other agents dropped seeds of many plants among the thorns. The most noteworthy of the intruding growths are: Blackthorn (*Prunus spinosa*), Dog-rose (*Rosa canina*), Honeysuckle (*Caprifolium perfoliatum*), Holly (*Ilex aquifolium*), Traveller's Joy (*Clematis vitalba*), Elder (*Sambucus nigra*) and Bindweed (*Convolvulus sepium*).

The mud from the ditches—washings from the roads and fields—is thrown up periodically to the hedge-bottoms, and the fresh soil maintains the varied growth in constant vigour.

*Mr Edwin Tearle, in after years Rector of Stocton, in the Diocese of Norwich.

Some of the byroads of England were formerly important highways. In a tour I made, in my youth, to Tennyson's country in North Lincolnshire, I came one day to a little place that, I was told by a countryman, was "Spittle-in-the-Street." After a little thought I understood the name. "Spittle" was '*Spital*, a contraction of *Hospital*, and the "Street" stood for the *Stratum*, the Roman way from Lincoln (*Lindum Colonia*—the *Colony-in-the-Marsh*) to the Humber. Yes, along that way, centuries ago, marched the legionaries of the Cæsars, in stern array, while the woad-stained Cortiani peeped out upon them from their coverts, in hatred and fear.

In after and pre-reformation days, a religious house of entertainment for travellers was erected beside the ancient roads, and this was the Hospital-in-the-Street. There remained of it a farmhouse and the chapel. In the latter a clergyman from a neighbouring parish held services at stated intervals.

In some parts of England where the country is of rolling surface, and the soil light—the lanes being frequently cut up by heavy farm waggons, and but little cared for—the soil is constantly washed by the rains to lower levels, and hollow ways are formed, such as those spoken of by Kirke White in one of his sonnets:

"God help thee, traveller, on the journey far,
The wind is bitter keen, the snow o'erlays
The hidden pits and dangerous hollow ways,
And darkness will involve thee."

In that powerful description of the Battle of Waterloo, given by Victor Hugo in *Les Miserables*, we are told of a grand charge made by three thousand five hundred French cuirassiers upon the English centre. At full speed, in the fury of the charge, the warriors came to the hollow way of Ohain, twelve feet deep, of which they were unaware. Unable to check their steeds, they plunged in, one upon another, and piled up—a writhing mass, crushed and broken. "One-third of Dubois' brigade"—says Hugo—"fell into that abyss." "This," he says, "began the loss of the battle."

But let us quit the contemplation of disasters and consider the delights of English lanes. And, truly, those lanes are delightful

—with their hedgerows gay with blossoms, diffusing sweet perfumes and jubilant with the song of birds!

English hedges are famous nesting-places for many of the feathered tribes. I can recall the pleasure of my first inspection of the nest of the Long-Tailed Tit (*Parus caudatus*). It was a seemingly compact ball of the finest and greenest moss; but it had on one side a small round entrance, closed with a feather. The tit lays many tiny white eggs, spotted with lilac.

Another nest that attracted my attention in my early days was that of the Red-backed Shrike (*Lanius collurio* L). The mother bird was sitting on her pretty, cream-coloured, richly spotted eggs. Meanwhile her mate was busy attending to her wants. He kept her larder well supplied. On the thorns around her were impaled little blind mice and callow birds, shewing that the common name of *Butcher-bird* was justly given to this feathered pillager. But—as an Eastern Township housewife said in praise of her husband, so we may say of the Shrike—"He is a good provider."

It is said* that the English ornithologist, Gould, dated his interest in bird life from the time when, in his childhood, he was lifted up to see the pretty blue eggs in a hedge-sparrow's nest.

Here and there, in the South of England, a lane leaves the enclosures and traverses a piece of common land covered with bushes of the Furze (*Ulex europæus*). This strange plant, which has spines instead of leaves, is, in its season, gorgeous in its wealth of golden bloom. Linnæus, on first beholding it upon Wandsworth Common, fell upon his knees and thanked God who had created a thing so beautiful.

Elsewhere the lane enters, it may be, a stretch of woodland, the game preserve of the lord of the surrounding Manor; and there, truly, the wayfarer is in the midst of charming sights and sounds. In early spring the woods around him are ankle-deep with blue-bells, anemones and primroses. Later in the year the stately foxglove (*Digitalis purpurea* L.) rears its shafts of purple bloom, and "lords and ladies" look out from their stalls.

Many beautiful butterflies sport around. I can mention but a few of them. The pretty Speckled Wood (*Lasiommata ægeria*)

*Country Walks of a Naturalist with his Children, p. 109.

is everywhere in evidence. The lovely Peacock (*Vanessa io*) and the Brimstone (*Gonepteryx rhamni*) shew well against the surrounding foliage. The Silver-washed Fritillary (*Argynnis paphia*) flits over the brambles, on which its larvæ feed. Once in an age a Queen of Spain Fritillary (*Argynnis lathonia*) makes its appearance—blown over, it may be, from France. The Bath White (*Pieris daplidice*) sometimes shews itself, and formerly the Black Veined White (*Aporia cratægi*) could often be seen.

Years ago, in such a wood, I saw what English entomologists seldom see—a specimen of the Camberwell Beauty (*Vanessa antiopa*). It came sailing over the tree-tops and lit upon an oak sapling immediately before me, and then opened its lovely wings. A moment—and it was gone! And I saw it again no more.

Where oak trees are plentiful in the forest, the monarch of English butterflies, the stately Purple Emperor, may sometimes be seen, and there the Purple Hairstreak will surely be found.

Remarkable instances of insect mimicry will engage the attention in such a wood. Here by the road-side is a bush of Broom—the *Planta genista* of olden times, from which the great Plantagenets of English History derived their surname:

> "That name Count Geoffrey did assume
> When, riding to the chase,
> He wore in his casque, instead of plume,
> A nodding crest of the yellow Broom,
> In its fresh and fragrant grace."

As the traveller approaches the shrub, he will be surprised to see a number of supposed *leaves* of the plant detach themselves from the twigs and flutter away. They are specimens of the tiny Green Hairstreak (*Thecla rubi*).

At another time, noticing the long cylindrical catkins of the Birch, he will be astonished to see that which he had taken to be one of them move away with alternate loops and strides. It is a larva of the Large Emerald Moth (*Geometra papilionaria* L.).

In the woodland lane the ear is—"charmed with concord of sweet sounds." Suppose yourselves in such a lane—call to your imagination its sights and sounds, and—

Let us recline beneath this tree,
So ragged with lichens—ragged and gray;
Its fretwork of leaves shall our canopy be,
Our carpet the moss where the sunbeams play.

And we'll list to the pipes of the robin and wren,
To the flute of the merule so loud and clear,
To the trumpet call of the cuckoo, and, then,
To the deep bassoon of the stock-dove near.

See you the black-cap 'mid the leaves!
With his glad song his bosom heaves;
His efforts rouse to rivalry
The pride of all Pan's company.

Of choristers, sweet Philomel,
And now soft cadence and rich swell,
And hurried note and note prolonged,
Echo the glades and thickets through;
As oft, when Sol is borne from view,
In his car of crimson clouds they do,
Till heaven with listening stars is thronged.

—T. W. F.

The linnet, the goldfinch, the bullfinch, the greenfinch, the whitethroat, the yellowhammer, the thrush, the misselthrush, and other birds, do their best to render the concert of the feathered tribes effective.

Here and there in the road-side hedges a crab-tree may be seen, and here and there a holly.*

The holly is sometimes grown as an ornamental hedge. John Evelyn had such a hedge, and he tells how the Czar of Muscovy (Peter the Great) and his outlandish crew amused themselves by trundling one another in a wheel-barrow, backwards and forwards through the prickly barrier. Evelyn had lent his house and grounds for the accommodation of the Muscovites. When the foreigners retired, they left a *muss* behind them.

## II.

### Canadian Lanes.

Doubtless, in olden times, when men were few and land grants under the feudal system extensive, hedging and ditching were ready means for enclosing and draining the land, and they have been enduring means.

In Canada the roads that remind one of English lanes, though in truth they are very different, are such as lead through parts of the country in which the old-fashioned snake-fences still enclose the farms and in which brush has been allowed to grow freely in the angles of the fences. In such localities, old roads abandoned for new ones, concession roads leading to a few homesteads off the main lines of travel, roads through sugar-woods and the uncleared forest—these, in their quietude and freedom from dust, are suggestive of English lanes—though they lack much of their beauty.

I will speak briefly of a few such roads:

The Caledonia Road.— Skirting a tract well known to the naturalists of Ottawa, by the name of "The Beaver Meadow," is a lane connecting the Aylmer Road with the Chelsea Road. It was originally a "Corduroy road," and it still ends in the remains of a swamp, in which *Typha latifolia* grows freely. Improvements in the neighbourhood have altered its appearance: the logs are gone, and the bed-rock is seen in much of its length; and this, in summer, is carpeted with Stone-crop (*Sedum acre* L.).

Alas! the Beaver Meadow has now been cleared, drained and laid out into building lots. The city naturalists will have to go farther afield for their investigations, and the Caledonia Road will soon become a city street. When I lived in Hull, however, I spent many tranquil hours within its quiet limits.

Muddy spots in the road were much frequented by butterflies. In bright days in April hibernated specimens of *Aglais milberti* Godart might be seen there. The spring larvæ of this species may be found feeding upon the young shoots of the Stinging Nettle (*Urtica dioica* L.). I raised two batches of them in 1911. They went into chrysalis in the first week of June. Sixty per cent. of them were parasitised by *Protopanteles atalantæ* Packard. The grubs of this fly issued from the larvæ of the butterfly—not through the spiny upper parts, but—through the tender ventral portions.

They spun their white, compact cocoons in clusters attached to the skins of their victims. The first imagos of *milberti* appeared in my breeding-cage on the 13th of June.

The large Skipper (*Eudamus tityrus* Fab.) might be seen on the Caledonia Road. I had become acquainted with this insect on Mount Royal, where its larvæ fed on the Hog-peanut (*Amphicarpæa monoica* Nutt), but there I had seen it in its short flights only, as it skipped from bush to bush. When there I witnessed its rapid flight through the open for the first time, I was puzzled. Its direct course; the peculiar motion of its wings; the flashes, in the sunshine, of the large, heart-shaped, silvery patches on the under side of the hind wings—all were new to me. I had to catch the insect to make sure of its identity. In the neighbourhood of Hull its larvæ feed on *Robinia pseudacacia* L. It gathers several leaflets of the tree together, binds them, and feeds under their cover.

A stream, the outlet of Fairy Lake, crossed the Caledonia Road, and over it a rude wooden bridge was thrown. At this point the Turtle-head (*Chelone glabra* L.), the Vervain (*Verbena verticillata* H. B. K.), the lovely Swamp Loosestrife (*Decodon verticillata* H.B.K.) and the Joe Pie Weed (*Eupatorium purpureum* L.) grew in a tangle. On the last named the larvæ of the handsome Tiger Moth (*Arctia caja* L.) fed.

Ought not this specific name to be written and pronounced *Caia?* Linnæus, in naming it, probably had in mind the form of words spoken by the bride in the marriage ceremonies of the ancients: "*Ubi tu Caius, ibi ego Caia.*" We have an instance of the use of the long i, or j, in the last of the numerals representing *four* —iiij. *Halleluiah* was spelt with a j in former times; and I once knew a worthy clergyman whose name was Micaiah, but who always spelt it *Micajah*, with a thought, I doubt not, of the sacred name in the 68th Psalm.*

On the growth spoken of above the pretty Neuropteron *Chauliodes serricornis* Say was often to be seen.

Along the Caledonia Road locusts were numerous. In 1909, particularly, our largest species, *Dissosteira carolina* L., abounded.

* Praise Him in His name Jah and rejoice before Him. Psalm LXVIII, 4.

But a natural check to its undue increase came; many of the insects were affected by *Entomophthora grylli*, and the species has not been so plentiful since.

Levis Military Road.—A by-way of interest to naturalists is the road connecting the Forts on Levis Heights. The ramparts raised for the defence of this road are now overgrown with brush, and bushes and young trees have sprung up on both sides of it. In the scrub the tall *Diplopappus umbellatus* (Miller) grows abundantly, and upon this the galls of *Gnoremoschema gallæ-diplopappi* Fyles may be found.

What a formidable name "Gnoremoschema" is! It was derived, I suppose, from the Greek, Gnorimos—well known, and Cheima—in winter. The insects that cause the galls, however, do not occupy them in winter. Having escaped their enemies and come to perfection, they quit their dwellings in August, or September at the latest.

But in some instances the galls are not without winter tenants, several kinds of Ichneumon flies, having preyed upon the former inhabitants, spin their cocoons within the galls and remain in them till summer comes around.

The young gregarious larvæ of that lovely butterfly *Melitæa harrisii* Scudder may be found, late in the season, in dingy, closely clinging webs, on the stalks of the Diplopappus. In the spring they disperse and thrive rapidly on the young shoots of the plant.

In this locality the Large-leaved Aster (*Aster macrophyllus* L.) grows plentifully. An insect of remarkable habits feeds upon it, viz., *Tricotaphe levisella* Fyles. The larvæ of this species fasten the edges of the large bottom leaves together and thus form ample tents within which they feed. A full description of the insect in its different stages is given in the 33rd Annual Report of our Society on page 28.

Another insect deserving of notice that may be met with along this military road is the fine ruby-winged locust described by Harris under the name *Locusta corallina*. (See "Insects injurious to Vegetation," p. 176).

Old St. Henry Road.—This road, when I lived at South Quebec, was a rich hunting ground for the naturalist. No less

than eight species of the Cicindel'dæ frequented it, viz., *longilabris*, *6-guttata*, *limbalis*, *purpurea*, *vulgaris*, *12-guttata*, *repanda* and *hirticollis*.

I took *Lexis bicolor* Grote on this road. *Thecla titus* Fabr. was plentiful there, and *Debis portlandia* Fabr., *Phyciodes nycteis* Dbl. and *Pamphila paniscus* Fabr. were there to be seen.

Where the road passed through damp woods, a plant that attracted attention was the White Lettuce (*Nabalus altissimus* Hooker). Its stout stems rose like spires, from the wayside, tall as a man, and clothed with long leaves. This plant is a habitation and food-store for *Aulax nabali* Brodie. By slitting its stalks late in the season, the cells or cocoons of the species may be found. The imagos bite their ways of exit from their hibernacula in March.

Eastern Township Lanes.—There are lanes and by-ways in the Eastern Townships that more nearly resemble the green lanes of England than those I have spoken of, and interesting objects appear in them. Riding slowly through one such lane in the year 1867, I witnessed a sight which I had never seen before, and which I do not expect to see again, namely—a small flight of Passenger Pigeons (*Ectopistes migratorius*). There were seven or eight of them. They lit on some second growth maples a few yards in advance of me. They flapped their wings, and flirted their long tails, and preened their fine plumage, greatly to my delight.

Two other kinds of birds, especially worthy of notice that came under my observation in the Eastern Townships' lanes were the Great Grey Owl (*Scotiaspex nebulosa*) and the Barred Owl (*Strix varia*). The former whose big round head seemed too large for his body was greatly disturbed at my appearance. It rolled its head and fidgeted and blinked at me, but seemed to doubt the propriety of taking flight—it may have been recently mobbed by other birds. I left it unmolested to its wise cogitations.

The Barred Owl is a smaller bird—trim and alert.

Green lanes in those parts are frequented by the strangely elusive and tantalizing butterfly *Grapta j-album*, Boisd. & LeC. It is an insect of rich colouring and powerful wing. It rises before you, and you watch its direct and rapid flight, and note the spot where it alights. You hasten thither, and, drawing nigh, walk

warily; but, look carefully as you may, you cannot perceive it. Suddenly it starts up, a few yards before you, and dashes away, and so on, till you abandon the pursuit. Its under side is of sober browns, like the fencing on which it usually alights. Gosse took this insect in the "Grove Lane" at Compton, P. Que. He named it the "Compton Tortoise." (See *Canadian Naturalist*, p. 247).

Along a by-road leading to the estate of the late Col. Calvin Hall in East Farnham a row of white elms had been planted. When I took notice of them, they were about fifteen feet high. It was in the Fall of the year, when, from some cause or other, the leaves of the elm curl over, and form rolls, on which the veins of their under sides are very conspicuous.

The trees I speak of had been visited by the Sphinx, *Ceratomia amyntor* Hubner, and I found a number of the larvæ of this insect feeding upon them, Strange to say, the larvæ took positions in which they closely resembled the rolled leaves—the ribbed side-lines of the caterpillars mimicking the veins of the leaves.

As the season advanced, the leaves of the elms changed from green to rusty brown, *and a corresponding change took place in the colour of the larvæ.*

But it is time I brought this paper to a close. It is one of reminiscences—a record of days gone by. I have written it in the hope that some into whose hands it may fall may be led by it to take a deeper interest in Nature Studies, to perceive a little more clearly some of the beauties in God's marvellous works, and to look up with deeper feelings of love and reverence to Him, for whose pleasure all these things are and were created.

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## THE CANADIAN ENTOMOLOGIST.

Owing to the greatly increased cost of printing of late years, it has been found necessary to raise the price of this magazine from $1.00 to $2.00 per annum, payable in advance. This includes postage to any part of the world. The change will go into effect with the beginning of the volume for 1914. Members of the Society, who are residents within the Dominion of Canada, will receive the magazine and annual report without charge if their subscriptions have been duly paid in advance.

# THE IMMATURE STAGES OF THE TENTHREDINOIDEA.

BY ALEX. D. MACGILLIVRAY,
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An interest in the study of the adults of the Tenthredinoidea has emphasized the necessity for some knowledge of their immature stages. This opportunity came the past summer through the offer of the Maine Agricultural Experiment Station to spend some time there collecting, breeding, and studying the larvæ of this group.

It is essential in all phylogenetic studies that the most generalized forms should be identified and the lines of specialization from these forms determined. This identification has been made for the adults and it was hoped that a study of their larvæ would throw some light on the validity of this classification.

The eggs are laid by the female within the tissue of the host plant. Where the larvæ are borers, the eggs are laid in holes made in the stems of shrubs or in the hard wood of the limbs or trunks of trees, with a thread-like ovipositor. Where the larvæ are leaf feeders, the eggs are placed in slits made by the female from the under surface, with an ovipositor consisting of two plate-like structures. The number of eggs placed in a single leaf varies greatly among the different species. In some only a single egg is inserted in a leaf; in others a large number, varying from three or four to thirty or forty. The recently laid eggs are difficult to locate, but they become swollen with age and then their location is easily determined.

The method of placing her eggs adopted by the female determines, to a certain extent, the feeding habits of the larvæ, as to whether they are solitary or gregarious feeders. Many species are solitary feeders throughout their entire life, a single larva on a leaf, part of a bush, or entire bush; the others are gregarious through the placing of many eggs in a single leaf or on closely adjacent leaves. Where many eggs are laid in a single leaf, the larvae developed from these eggs may be gregarious throughout their entire larval life or only for a time, when they are half grown they gradually disperse over all parts of the bush and are solitary in their habits for the remainder of their life.

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The embryo requires from twelve days to three weeks to complete its development, the length of time varying considerably with the species. While the larva of each species passes through a definite number of instars, the number varies considerable among the different groups of species. The larvæ usually require about fifteen days for the completion of their growth.

There is great variation in their method of feeding. The great majority of the nematids are edge feeders; they cling to the edge of the leaf with the thoracic legs and when disturbed, bend their abdomen back onto the thorax in an S-shaped curve. Many emphytids and selandriids rest with their body stretched out flat on the underside of the leaf and eat holes in the leaf or feed from the edge; others, while feeding in a similar manner, rest with the body curled helix-like, with the anal prolegs forming the apex of the helix. This is also true of the cimbicids, *Cimbex* and *Trichiosoma*, which are edge feeders, resting curled on the upper surface of the leaf. A few nematids and selandriids also feed on the upper surface—some with the body helix-like, others extended. The phyllotomids, including the genus *Caliroa*, are leaf skeletonizers, feeding only on the parenchyma of the under surface. The very young larvæ of many of the groups are also skeletonizers during the first or second instars. The lophyrids, which feed only on conifers, begin at the the free end of the needle, clasping it between the prolegs, and eat towards its base until only a stub is left. The dolerids, or what I believe to belong to this group, for none of the American species have been bred, feed on sedges (*Carex*), feeding on the ends of the blades; the same is true of some of the grass-feeding nematids. The pamphiliids are either gregarious, when they fasten several leaves together into a nest with threads of silk, or solitary, when they roll the edge of the leaf and fasten it together with silk. These larvæ are the only ones, so far as I know, that use silk in this way. The fenusids and scolioneurids are leaf miners.

The body of the larva may be either black, white, green, spotted or banded. A large proportion of the species are white or green. In the green species the colour is due, in great part, to the colour of the blood and the food contained in the alimentary canal. They are also usually banded dorsally (the dorsal blood vessel) and marked on each side of this band and along the pleura by frosted

lines (the dorsal pleural air tubes). A few species are marked on the dorsum and some on the pleura adjacent to the spiracles of certain segments by large yellow patches, which are due to lobes of adipose tissue or fat, which show through the cuticle. Many species are marked with pigmented colours; only one so far as observed has a median dorsal line, *Cimbex*. There is great variation in the arrangement and time of appearance of these colours. The entire body may be black or brown, or consist of longitudinal or tranverse rows of spots. Larvæ that are white when they emerge from the egg, may be entirely or almost black or chocolate brown in the latter part of their larval life, while those that are black when they emerge from the egg, may be almost entirely light-coloured when mature.

The larvæ, when fully fed, moult their skins and seek a place for pupation. This last moult may take place before they leave the host plant or after that time. There is no striking difference in the form and appearance of the body of most of the green or white larvæ, but those with prominent spines and black spots loosen the spines and spots and become opaque white; some that are white become distinctly spotted; some that are black or black-spotted become green, white, or glassy green, and still others that are opaque white through all the preceding stages have black spots about where the setæ were located. This diversity in form in the different stages makes it very difficult, until both stages have been recognized for a given species, to determine whether you are working with one or two species. This last larval stage has been designated as the ultimate stage by Dyar, who has done more toward elucidating the life-histories of the American species of sawflies than all the other workers together.

After the assumption of the ultimate stage some larvæ remain quiet for a time, resting upon the food plant; but the great majority leave the host plant and wander about in search of a place to prepare for pupation. The xyelids, pamphiliids, and blennocampids form cells in the ground, the emphytids and selandriids bore into rotten wood; also some nematids, which have the same habit, and so far as observed all these have a striking ultimate stage. The end of the tunnel is plugged with frass and the cavity left unlined with silk except a few species, which make a very thin

cocoon. The great majority of the larvæ of the saw-flies form cocoons just beneath the surface of the ground or among the debris on its surface, as the lophyrids, dolerids, phyllotomids, tenthredinids, holocampids, acordulecerids, hylatomids, and most nematids. Some individuals of the first brood of the lophyrids attach their cocoons to the leaves of the host plants. The cocoons of the acordulecerids are white and compact; those of the hylatomids large, white and lace-like; while in all the others the cocoons are dense and black or brownish in colour.

In most insects, when the cocoon has been formed by the larva, it transforms almost immediately to a pupa—at least, within a week or two. A different condition is found among the larvæ of the saw-flies. Some of the species are, so far as known, always single brooded; the larvæ of such species emerge early in June, complete feeding in a few weeks, enter the ground or rotten wood, form their cocoons or cells, but live as larvæ within them until the following spring, when they transform to pupæ, and emerge as adults in May or June. A similar condition is found in those species that are apparently more than one-brooded, the ultimate larval stage is long and the pupal stage short. Writers frequently refer to the time when the larvæ form their cocoons or enter the ground as the beginning of the pupal stage. Such a designation is clearly incorrect.

Any statement as to the number of broods of any given species of saw-fly should be made with reservation. Many insects, probably a large majority, appear at a definite, stated time, usually not exceeding a period of two or three weeks and sometimes less. Such a condition does not exist in this group, for adults may appear over a period of four to eight weeks, so that it is possible to find on the same host plant and even on the same leaf, if the plant be one that has large leaves as a dock (*Rumex*) larvæ that are fully grown, others that have just emerged from the egg, and various sizes between these. Such a condition in June would probably mean that they were larvæ from the eggs of females produced from wintering larvæ, but in July the young larvæ may have been produced from the eggs of females that have matured the same season or from females produced from wintering larvæ that have been very slow in development. The field conditions would warrant considering

such a species as single brooded, while the breeding experiments show conclusively that it is two brooded. The determination is further complicated by the fact that in those species producing summer females, not all the larvæ transform the same season, but, with the exception of a few species, the great majority of the females do not appear until the following spring. So that the second so-called brood is in reality only a partial brood; this is a well-established fact in the case of *Lygœonematus erichsonii* and *Pteronus ribesii*. In some species there is evidently a partial third brood.

The pupæ of saw-flies do not differ from those of other Hymenoptera. The antennæ, legs and wings are enclosed in separate cases and lie free on the breast of the insect.

The fact that saw-flies produce only partial second or third broods is also substantiated by the scarcity of adults during July and the following months. This time will vary somewhat, depending upon the altitude and latitude of the location. In most regions the adults are found in greatest abundance in May and June. They should be sought on the leaves of plants along the edge of forests, along fences and roadsides, and on the plants of marshy places.

## ADAPTATION IN THE GALL MIDGES.

BY E. P. FELT, ALBANY, N.Y.

Adaptation is defined in the Century Dictionary as an "advantageous variation in animals or plants under changed conditions." This definition is sufficiently broad to include practically every modification resulting in a variation from what might be construed as the normal for a given family, tribe, genus, or even species. It is well known that every animal is exposed to numerous natural hazards during its life. Existing species must be equal to these perils or become extinct. It is convenient to group the forms of adaptation under three heads.

1. *Strength, aggressive and defensive.* We can all recall forms which appear well-nigh invincible because of superior physical development—muscular or defensive. The lion and rattlesnake represent two familiar and diverse types belonging in this category. One is remarkable for its superior muscular development and the other possesses a peculiarly efficient means of defense.

2. *Prolificacy.* There are numerous species with no particular physical efficiency. Some of these latter owe their existence largely to prolificacy. The common river shad, for example, may produce from 60,000 to 156,000 eggs, while a seventy-five pound cod may contain 9,100,000 ova. This extraordinary prolificacy is evidently a provision of nature to offset the numerous perils threatening the fry. Some of our plant-lice attain the same end by producing a number of generations annually. For example, the common hop plant-louse is capable of producing twelve generations in a season, the final progeny amounting to over ten sextillion. The increase in this latter species is by geometrical, not arithmetical, progression.

3. *Evasive adaptations.* There are hosts of species which escape extinction by the exhibition of more or less cunning in avoiding the many natural perils. This may be the result of modifications in the biology, peculiarities in habit, specializations in structure, or even cryptic or other resemblances. We have sometimes wondered if these factors, physical development or strength, prolificacy and evasive adaptations could be assigned sufficiently exact values that, if two were known, the third could be ascertained.

The gall midges exhibit a most interesting condition. The approximately 800 American species known probably represent only one-third to one-fifth of our fauna. Some 450 species have been reared from 183 plant genera representing 65 plant families. The largest of the gall midges is only about one-fourth of an inch in length, while the smallest measures scarcely one-fiftieth of an inch. Local in habit, slow of flight, fragile in structure and far from attaining an extraordinary prolificacy in many instances, how do these multitudinous species maintain themselves? Physical development, either aggressive or defensive, is hardly worth mentioning.

*Biological adaptations.* There are good reasons for believing that gall midges are allied to the fungus gnats or Mycetophilidæ, many of which live as larvæ in decaying organic matter. The inner bark of various trees in incipient decay may contain hosts of Miastor and Oligarces larvæ. These maggots are remarkable because they exhibit a modification of parthenogenesis known as pædogenesis, an adaptation of inestimable value to species living

under such conditions and dependent upon weakly organized adults for their establishment in favourable conditions. These midges produce only a few eggs and evidently possess very limited powers of flight. The larvæ are capable of penetrating only the weaker, semi-rotten tissues of bark and sapwood and are preyed upon by voracious maggots belonging to the genera Medeterus, Lonchea and Lestodiplosis. All too frequently the only evidence of Miastor infestation is the abundance of predaceous maggots which have devoured practically every inhabitant of a once populous colony. The ability to produce young in an indefinite series of generations by maggots advancing in unoccupied tissue is a great advantage in avoiding such enemies as those mentioned above. We also have in this series of pædogenetic generations an example of multiplication by geometrical progression such as obtains among our plant-lice.

Certain species like the Hessian-fly, sorghum midge, violet midge and rose midge depend for existence to a considerable extent upon the production of several generations annually; in other words, increase is by geometrical progression. The extraordinary efficiency of this form of adaptation is strikingly illustrated in plant lice as mentioned above. Such species, if able to subsist upon farm crops or other products valuable to man, are potentially serious pests. One generation annually appears to be the normal for many midges, and consequently the ability to produce more in a season must be considered a favourable adaptation to existing conditions.

*Midge galls.* Recalling the fact that the more ancient type of gall midges appears to be related to the fungus gnats or Mycetophilidæ and that they furthermore exhibit similar preferences in that the larvæ occur in organic matter in various stages of decay, one would expect to find a series of galls showing gradual modifications from this comparatively simple habitus to the more complex type of shelter so frequently observed in this group.

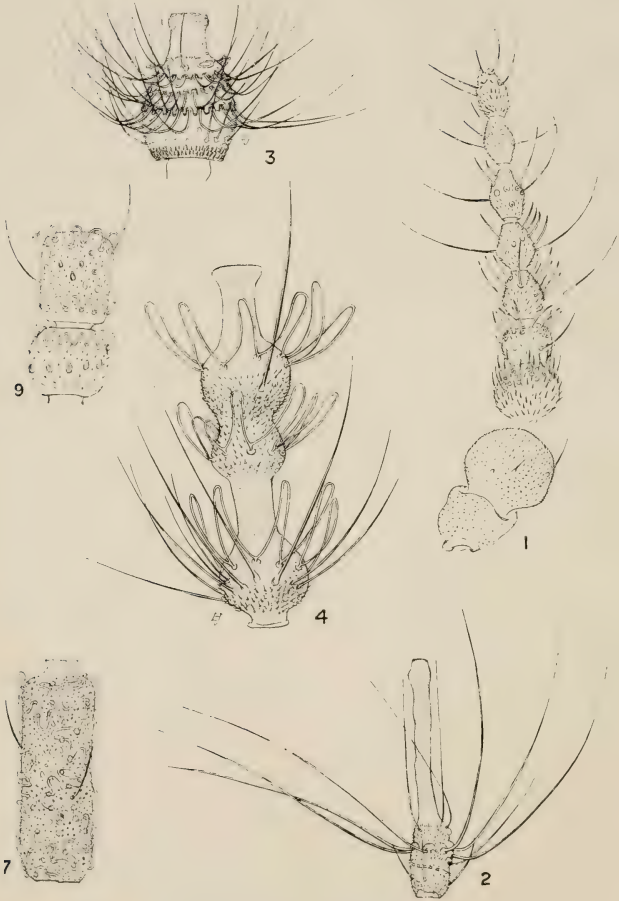
*Bud galls.* Possibly the simplest type of midge gall is to be seen in the irregular, loosely and various developed bud galls produced by some species of Dasyneura and its allies. The eggs appear to be simply dropped among the developing floral organs or leaves and the larvæ obtain their sustenance by absorbing nutriment from adjacent tissues. The weakening of the latter prevents

normal development and, in some instances, at least, we have the conspicuous and rather characteristic rosette galls such as those of species of Rhopalomyia upon Solidago and of Rhabdophaga upon willow.

The growing point of a plant stem, whether it forms a leaf, bud or a flower, affords such ideal conditions for nourishment, that it is not surprising that certain genera should be restricted in large measure to such favourable habitus. This is particularly well marked in Asphondylia and certain of its allies, which not only confine themselves largely to bud galls, but have become so specialized that they are particularly adapted to the production of such deformities.

*Leaf galls.* The leaf gall, like the bud gall, usually begins as a development upon expanding or tender tissues. The simplest type is probably a marginal leaf roll, and this differs from certain of the bud galls simply by the fact that in the roll only a portion of the leaf is involved, while in the bud gall all of the several leaves may be distorted or have their development arrested. Vein folds are produced simply by the larvæ congregating or restricting their operations to this portion of the leaf rather than to the margin. They vary greatly in character and may be limited to the midvein or to the lateral veins, may be comparatively simple and composed of greatly hypertrophied tissue or ornamented with a conspicuous white pile or other development such as is found in that of *Cecidomyia niveipila* O.S. These leaf rolls and vein folds are usually produced by a number or small colony of larvæ.

Blister leaf galls and the more highly developed globular or conical galls are generally produced by single larvæ hatching from eggs deposited in or upon the buds before the leaves have unfolded. The peculiar blister galls on Solidago and Aster are multilocular, are easily recognized by the typical discoloration and thickening of the leaf, and are produced almost without exception by the genus Asteromyia. These galls represent a slightly more advanced condition than obtains in certain species which live between the upper and lower epidermis and either produce only a slight discoloration as in certain species of the genus Cincticornia, or else excavate a fairly well defined mine, such as that of *Lasioptera excavata* in Cratægus. The globular or lobulate galls of *Cincticornia globosa*




GALL MIDGE STRUCTURES

and *C. pilulæ*, respectively, as well as the conical and globose enlargements of various species of Caryomyia upon hickory, must be considered as extreme types or modifications of the blister gall.

*Stem galls.* No part of the plant is exempt from infestation by the small representatives of this large family, be it seed, flower, leaf, stem or root. The stem gall is usually subcortical, and in those produced by midges, development generally begins while the tissues are still in a soft and plastic condition. They are usually polythalamous and are frequently irregular, more or less confluent swellings in the bark.

The medullary, stem or branch galls differ from the preceding in that the larvæ confine their operations to the interior of the affected tissues, frequently restricting themselves to the pith and producing rather characteristic deformities.

*Root galls.* There are only a few root galls known, probably because of the great difficulty in finding them. There appears to be no marked difference between these and the stem galls, aside from the point of location.

Recalling the fact that gall midge larvæ are small, without defensive armor or apparatus, with masticatory, or boring organs poorly developed or absent, it is obvious that this gall-making habit is one of the most important adaptations in the family. The gall midges have been able to maintain themselves in hosts and in many and varied forms by adaptations which have led to their seeking sustenance and shelter in places comparatively free from invasion by other insects. Not only have these small insects learned to prey upon numerous plants, but some have found it advantageous to wring sustenance from their associates. The species of Lestodiplosis, in particular, may be reared from a great variety of galls, and the larvæ have even been observed preying upon gall midge maggots, especially those of Miastor. Members of this family have also learned the value of other insects as food, and we now have records of a number of species preying upon scale insects, various plant-lice and red spiders.

Intimate relations exist between certain genera of gall-midges and families and species of plants. It is perhaps sufficient to note in this connection that the genus Cincticornia is practically confined to Quercus, Caryomyia to Carya, Rhopalomyia largely to

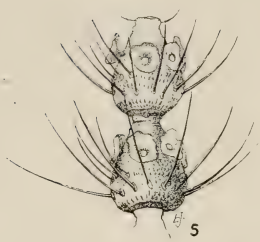
Solidago and Aster, and Rhabdophaga mostly to Salix. The mere statement of these facts indicates a correlation which has been discussed more fully by the writer elsewhere and need not be dwelt upon at the present tine.

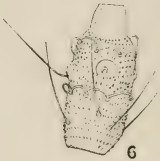
*Structural adaptations.* It might be thought that this host of gall midges, with its general similarity of habit, would exhibit comparatively slight variations in structure. Modifications in anatomy almost invariably mean variations in habits ,and consequently they are worthy of note, even though they be but signs of unknown facts, in the same way that irregularities in the movement of a celestial body may mean the existence of an unknown planet. We wish for a few minutes to call attention to some of the more structural modifications.

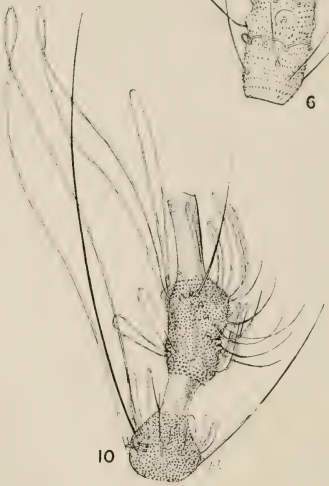
*Antennæ:*—The antennæ in this family present a most extraordinary range in development, varying from comparatively insignificant and presumably relatively useless organs with but 8 segments in Tritozyga and Microcerata to the rather highly specialized organs with as many as 33 segments in *Lasioptera querciperda.* There is an equally great variation in the form of the antennal segment and their sensory organs. The cylindric antennal segment is undoubtedly the more generalized type, as it is the one found most frequently in the Mycetophilidæ. This may be modified to form a cylindrical larger base and a greatly produced distal stem, in some instances the latter attaining a length three times that of the basal enlargement. The basal portion of the antennal segment may be conical as in many Campylomyzariæ or globose as in Joannisia, while in the Itondidinariæ we have a dumbbell-shaped structure, the basal distal enlargements being separated by a stem, with a similar constriction at the apex of the segment. This peculiar modification undoubtedly means greater efficiency in the sensory organs, since they are more widely separated, and is characteristic of the males in one large tribe.

The antennæ of the more primitive groups, such as the Campylomyzariæ and the Heteropezinæ, bear a number of peculiar sensory organs, the more remarkable of which are the so-called stemmed disks in the genus Monardia. These are probably olfactory in function.

The Itonididinæ, as limited by us, may be easily recognized







GALL MIDGE STRUCTURES.

by the presence of peculiar, colourless, thread-like, homogeneous, chitinous structures which we have named circumfili because they invariably run around the segment. They originate or arise from the interior of the segments, are presumably auditory in nature and are discussed by Europeans under the names of arched filaments (verticili arcuata and filets arques) and bow whorls (Bogenwirtel), since these common names aptly describe the structures as seen in the males. These organs in the females generally form a slender girdle near the base and distal portion of the enlargement on the flagellate antennal segments, the two being connected by one or two longitudinal threads. In the males the development may be very diverse. In the case of the male Asphondylia the circumfili consist of a more or less variable series of extremely tortuous, slightly elevated threads reaching from the base to the apex of the segment. In the Itonididinariæ the circumfili of the male are frequently prolonged into a series of bow-like loops girdling the basal and apical enlargements of the antennæ; one on each in the bifili and in the trifili with two on the distal enlargement. The loops of the circumfili or bow whorls may be simply conspicuous sinuosities as in Caryomyia or greatly prolonged on one side and having a length equal that of the entire segment as obtains in Aphidoletes and Bremia. A unique form of circumfili occurs in the genus Winnertzia. Here these structures greatly resemble minute, horseshoe-like appendages, one on each face of the segment, the produced free ends extending beyond the apex of the enlargement, while the supporting vertical threads give the appearance of a series of nails.

The peculiar circumfili, quite distinct in structure from auditory setæ, suggest our latest means of communication, the much vaunted "wireless," and present distinct analogies thereto. Both respond to impulses conveyed through air. It is possible the circumfili are "tuned" to vibrations unrecognizable with our finest instruments, and while the devices of men may convey signals several thousand miles, there is no reason for thinking that these unique antennal structures are relatively less efficient.

*Palpi*:—The normal number of palpal segments appears to be four, though these organs may become greatly reduced in any one of the tribes and in one genus, Oligarces, appear to be wanting.

The development of these organs affords a good systematic character and is correlated in certain instances at least ,with important modifications in habit.

*Wings*:—The organs of flight are of great value in taxonomic work and, in this family, present satisfactory characters for the delimitation of subfamilies and tribes. There is a cross-vein connecting subcosta and the third vein which occurs in a well-developed condition in the Lestremiinæ and the Epidosariæ, it being rudimentary or absent in the other groups except certain Heteropezinæ. The presence of the fourth vein is limited to the Lestremiinæ, in which subfamily it may be either forked or simple. The fifth vein also presents important modifications in that it may be simple, in which case there is frequently a sixth vein, or forked, in which latter instance the sixth has become partly fused with the fifth. Certain genera in the Heteropezinæ are remarkable because of the weak wings and greatly reduced venation.

*Tarsi*:—The normal number in segments is five, members of the Itonididinæ invariably having the first segment greatly reduced. Certain genera of the Heteropezinæ have four; others three, and in Oligarces there are but two tarsal segments. The claws may be simple, pectinate or dentate. They vary greatly in development and the same is true of the pulvilli.

There are other structures presenting equally significant modifications. This is particularly true of the generative organs and is especially well shown in the modified ovipositor which reaches an extreme development in the needle-shaped organ of Asphondylia, an instrument evidently designed for the piercing of thick bud tissues so that the egg may be deposited close to the growing point and in a place where conditions are most favourable for the development of the young.

It will be seen from the foregoing that the gall midges can not be counted as particularly strong or prolific forms, yet they have been able to maintain themselves largely by what we term evasive adaptations, which have resulted in their securing a very large degree of protection at the expense of the host plant. This summary is not intended to exhaust the subject, but is presented for the purpose of calling attention to a group exhibiting numerous unsolved and exceedingly interesting biological and morphological problems. There is perhaps no insect family better

suited for the study of adaptation in numerous ways than the gall midges, a large group which up to recent years has been almost ignored by students.

## Explanation of Plates XII and XIII.

1. Antenna of *Microcerata spinosa* male, showing 9 short segments. This organ is shorter in this species than the palp.

2. Sixth antennal segment of *Colpodia diervillæ* male. Note the greatly produced distal stem.

3. Fourth antennal segment of *Prionellus graminæ* male, showing the conical shape and the peculiar whorls of long setæ arising from distinct crenulate chitinous ridges.

4. Fifth antennal segment of *Karschomyia viburni* male, showing a binodose, almost trinodose structure of the segment and the peculiar circumfili or bow whorls.

5. Seventh and eigth antennal segments of *Monardia toxicodendri* female, showing the general shape of the segments and the characteristic stemmed disks.

6. Fifth antennal segment of a *Rhopalomyia* female, showing the generalized type of segment and the low circumfili commonly occuring in the female *Itonididinariæ*.

7. Sixth antennal segment of *Asphondylia monacha* male, showing the low, very tortuous character of the circumfili.

8. Fifth antennal segment of the pear midge, *Contarinia pyrivora* male, showing the binodose character of the segment and the two well-developed circumfili, the latter characteristic of the bifili.

9. Fifth antennal segment of *Caryomyia caryæ* male, showing the short though plainly sinuous circumfili, the three on a segment being characteristic of the trifili.

10. Fifth antennal segment of *Aphidoletes hamamelidis* male, showing its binodose character, circumfili, and particularly the greatly produced loops and setæ on the dorsal aspect.

11. Sixth antennal segment of *Winnertzia calciequina* female, showing the peculiar horseshoe-like circumfili attached to opposite faces of the subcylindric segment.

12. Extended ovipositor of the nun midge, *Asphondylia monacha* female, showing the basal pouch, the thick eversible basal portion of the ovipositor and the highly developed needle-like terminal part.

## INSECT GALLS.

BY A. COSENS, TORONTO

(Abstract of lecture, illustrated by lantern slides.)

In the evolution of the study of galls there are different epochs, each merging gradually into the following. From early historical times these abnormal structures have excited attention. In the first instance, this was in all probability due to the fact that they presented phenomena unusual and out of the ordinary. At this earliest epoch witchcraft and like fanciful explanations were proposed to account for their origin. Gradually, as they were better understood and seen to involve a stimulus by a parasite and a response by a host, the examination of them became more scientific, and the hypotheses concering their causes, as a consequence, more valuable. The problem presented was recognized as one of great scientific interest, since it presented the unique feature of a foreign organism stimulating and controlling for its own benefit the growth of a host. Within the last few years it has been shown that a close relation exists between the structure of the bacterial crown gall and certain malignant animal tumors. Thus the second epoch with the subject of theoretical interest seems gradually to be passing into a third in which it will rank as one of the greatest practical importance.

The term "gall" is applied to any enlargement of plant cells, tissues, or organs induced by the stimulus of a parasitic organism as a regular incident in the life history of the parasite.

Galls are divided into two classes, according to the agent that produces the stimulus—namely, *Phytocecidia*, those owing their origin to parasitic plants and *Zoocccidia*, those produced by animal parasites. The former are caused by many different classes of plants, myxomycetes, bacteria, algæ and fungi. Even the flowering plants are represented among the gall producers, since the witches' brooms and the spherical stem swellings on the black spruce are due to the stimulus of the dwarf mistletoe *Arceuthobium pusillum*. The latter are incited by mites (*Acarina*) and by insects in several different orders as follows: *Hemiptera* (Families *Aphididæ* and *Psyllidæ*), *Diptera* (Families *Cecidomyidæ* and *Trypetidæ*), *Coleoptera* (Families *Buprestidæ*, *Cerambycidæ* and *Curculionidæ*), *Lepidoptera* (Families *Gelechiidæ*, *Sesiidæ*, *Tineidæ*),

*Hymenoptera* (Families *Cynipidæ* and *Tenthredinidæ*). From the Bryophytes to the Spermatophytes nearly all plants are subject to gall formations of this class.

The type of gall produced by the orders Acarina and Hemiptera is simple in structure, consisting usually of a more or less pronounced folding in the leaf of the host, often accompanied in the former by an abundant production of trichomes. The Coleoptera and Lepidoptera originate galls that show little differentiation of tissues and an entire lack of a well-defined nutritive layer. The Dipterous forms are in some cases as simple in structure as the Acarina pouch galls, but in others are as complicated as any of the highest types of galls. In the order Hymenoptera are two families, Cynipidæ and Tenthredinidæ, the members of which produce galls that are in marked contrast to each other. The sawfly galls are characterized by a very pronounced proliferation of tissue without differentiation into distinct layers except at the very earliest stages of gall production. The Cynipid galls, by way of contrast, have invariably three distinct zones of tissues, and only seldom is a fourth absent. These layers have the following relation to each other. Lining the larval chamber is the nutritive zone with cells oriented usually in a radial direction. Bounding this layer on the outside is situated the protective sheath, the zone that is absent in a few types. Outside of that again the parenchyma or tannin zone is differentiated, passing out to the epidermal layer.

One fundamental and far-reaching principle of gall production by insects is that the stimulus does not endow the protoplasm of the host with power to produce new types of organs, tissues, etc. Structures are in many cases originated that are not found on the same part of the normal host, but invariably their prototypes are present on another part of the plant or a nearly related species. The protoplasm is so stimulated that not only are dominant characteristics strengthened, but also in certain cases latent properties are called into activity, and thus the apparent new type of production appears in the host. This principle can be illustrated in the case of glands, trichomes and aeriferous tissue.

It may be stated, as an unvarying rule, that when glands are present in the normal tissue, they are always more plentiful or

larger in the gall originating from that tissue. This is exemplified in the galls produced by *Eurosta solidaginis* Fitch, *Aulacidea nabali* Brodie and numerous other species.

But glands also occur in certain galls on parts of the host that are normally glandless. Thus they are plentiful in the gall produced by *Neolasioptera perfoliata* Felt on *Eupatorium perfoliatum* L, but are not found in the same location in the normal, but are, however, present at the base of the stem. In *E. urticæfolium* Reichard they likewise occur in the transitional region between stem and root, while in *E. purpureum* L they are present in the roots, petioles and flowering axes, as well as in the cortex and pith of the stem. In the case of gland production, it is clear that not only have active characteristics of the protoplasm in that direction been stimulated to an activity greater than the normal maximum, but nearly dormant properties have sometimes been aroused into action.

The trichomes exemplify the principle in a very similar manner to the glands. When the gall produces types different from the normal, these are invariably found on the reproductive axes of the host. The unicellular acicular hairs of *Eriophyes querci* Garman are totally unlike the stellate hairs of the leaf, but their exact counterparts are found on the reproductive axes of the host *Quercus macrocarpa* Michx. The much convoluted type of hair present in the Acarina dimple gall on the leaves of *Acer negundo* L. are found plentifully distributed over the reproductive axes, although the normal leaf hairs are straight. The trichome-producing activity of the protoplasm has thus been stimulated by the foreign organism to a degree reached in the normal only at the time of reproduction.

The production of aeriferous tissue in certain Salicaceous galls also substantiate the principle in a very striking manner. These galls contain examples of a typical aeriferous tissue, comparable, indeed, to that found in such aquatics as Nymphæa, Potamogeton or Saururus; while in the corresponding parts of the host it does not occur. Indeed, this statement may be extended to include all the species of the host genus. A cross section of the gall originated on *Salix cordata* Mühl. by *Rhabdophaga triticoides* Walsh shows this tissue surrounding each larval cell. It is present in the abnormal

stem and extends entirely across the pith. While this tissue is present in the primary cortex of the normal stem of both Salix and Populus, and indicated in the pith of the latter, it is entirely absent from the pith in the corresponding part of the stem of Salix. It is abundant in such primitive regions of Salix as the reproductive axes, nodes and leaf traces. Thus the unexpected appearance of this tissue in the gall cited is readily explainable on the same grounds as in the case of the glands and trichomes—namely, the power to produce this tissue is latent in the protoplasm of the host, and it becomes sufficiently active to reinstate the tissue only when the gall-producing stimulus gives rise to unusual conditions.

A further illustration of this principle is shown in the production of cork in an aphid gall on the leaf of *Passiflora suberosa*. While this tissue is entirely absent from the unstimulated leaf, the stem produces it normally. Also, *Rhodites multispinosus* Gillette stimulates the usually unarmed stem of *Rosa blanda* Ait to the production of an exceedingly spiny gall. The production of spines, however, is a marked characteristic of the genus and a dormant activity has again been aroused.

Concerning the mode of application of the stimulus by the parasite, it may be stated that in none of the orders of insects except the Tenthredinidæ is there any evidence that indicates the beginning of gall formation before the hatching of the larva. In this family the source of the stimulus is in all probability the ovipositor of the insect, since it has been conclusively shown that the gall structure is well advanced while the larva is still within the egg membranes.

From observations on the galls of *Neuroterus læviusculus* and *Biorhiza aptera*, Adler concluded that cell division commenced only after the larva emerged from the egg. Weidel lately has shown that such is the case in the gall produced by *Neuroterus vesicator* Schlecht. It may, as a consequence, be accepted as proven that the source of the stimulus in the galls produced by the Cynipidæ is the larva of the producer.

As already published* the writer has proven by a series of experiments, that the larva of *Amphibolips confluens* Harris

*Transactions of the Canadian Institute, Volume IX., 1912.

secretes an enzyme capable of changing starch to sugar, and has also demonstrated the presence of salivary glands opening externally in *Philonix nigra* Gillette and *Amphibolips confluens* Harris. We may conclude, then, that at least one enzyme is present in the salivary secretion of the larvæ of the Cynipidæ and that this acts as a pre-digestive ferment on the contents of the nutritive zone. By its action, starch is changed into a readily soluble substance, and is consequently readily absorbed by the digestive tract of the larva. On account of this amylalytic ferment in the larval secretion the nutritive zone will become stored with an unusually large amount of available nourishment which can diffuse to all parts of the gall. The material thus prepared supplies nourishment for both the larva and the gall. The protoplasm of the latter is thus rendered unusually active since it receives an abnormal quantity of available food material in a limited area. The hypertrophy and cell proliferation and probably also the appearance of vestigial tissue, or other primary characters, are, in my opinion, the response of the protoplasm of the host to the additional food supply.

## CHRYSOMELIANS OF ONTARIO.

BY F. J. A. MORRIS, PORT HOPE, ONT.

The title of my paper may be misleading to some of you, and I should like at the outset to explain my attitude. It is simply that of a nature-lover led(more or less by accident) to collect some of the insects observed by him about trees, flowers and leaves, while roaming about the countryside with what Wordsworth calls "a heart that watches and receives."

Of technical knowledge I have little or none to offer, and my interest in the economics of Entomology is subject to prolonged fits of catalepsy; indeed, I doubt if it has ever shaken off this blanket of suspended animation sufficiently to appear in really stark-naked wide-awakeness. The fact is, an amateur collector is drawn chiefly by the giddy pleasure of the eye; most of the time he goes about craving new specimens, probably those of large size and bright colour; he is an enthusiastic and irresponsible schoolboy, easily pleased, easily deceived. I knew a collector once in England —I should have called him then, in my ignorance, an old man—

he certainly had grey hairs in his head—a respectable married man and a regular church-goer, but alas, gentlemen, a lepidopterist in an advanced stage. He greatly coveted specimens of the swallow-tail butterfly. This is almost extinct in Great Britain, though still occasional in the fens of Cambridgeshire; the made-in-Germany kind that are exported from the continent to English dealers, ready set and pinned, did not satisfy him, and at last he was obliged to compromise matters by rearing some imported larvæ and liberating the imagoes in his back garden, in order to catch them again with his butterfly net. Now, what is that but childish make-believe? Unfortunately, most of us left this faculty of self-deception behind in the nursery and are incapable of hoodwinking ourselves so easily. Yet I confess to a greater liking for my specimens of Asparagus Beetle since I took them on wild plants that were not growing in a garden, and I never really loved the Potato Bug and the Squash Beetle till I caught them on my side of the farmer's fence, the one feeding on the Bittersweet and the others on the blossoms of the Goldenrod.

Moreover, were it not that such a consummation would jeopardize the existence of one of the world's lilies and eventually defeat its own end, I'd sooner see every stalk of asparagus in my own as well as in all my neighbours' gardens devoured by either species of Crioceris( both, perhaps) than invent or discover an insecticide that should prove fatal to so pretty a beetle.

It is, I admit, bearding the lion in his den to appear before an audience largely composed of economic entomologists and talk from so alien a point of view as this about Chrysomelidæ of all insects in the world; for in the whole order of Coleoptera this is probably the one family that most violently flaunts its existence before the public eye, by the invasion of the kitchen garden.

Is there such a thing as a beetle-fancier, I wonder? If there is, that's what I am, and to show you that I have the courage of my opinions, I invite you all as fellow-members of this Society, or as guests interested in insects, to join me in a cross-country tramp north of Port Hope on a fine day about the middle of July. We shall start from our honoured President's old home of Trinity College School, and in order to enjoy the day thoroughly I'll ask each of you for a little while to fancy yourselves back at school

once more—throw away the burden of years and the cares of a responsible position; drop the handle from your name, college degree and the rest of it—forget it all. What you want is a little zest for the day's captures and (as we shall be out for the day) a sandwich or two in your pocket against the noontide hour.

We have green lanes and fields right at our door, but as our road will in any case be a long one, we shall condescend to get a lift by boarding the morning train for Peterborough and riding as far as Quay's Crossing, five miles up the track. I am giving myself as well as you a treat, for this is a favourite walk, and I may not have many more opportunities of taking it. But for all the hundreds of times that I have trodden these paths and roamed the woods and fields, I do not think I have ever come out entirely or even primarily as a Coleopterist. The countryside all means far more than beetles to me, so I must ask you to pardon the digressions, which may be many. I hope they will not weary you.

During the few minutes of our train ride, let us briefly review the family of Chrysomelians. There are no less than 18,000 species of these leaf-eating beetles known in the world; the vast majority are tropical; North America can claim only about 1-25th of this number and Ontario about 1-70th. But even Ontario's share, nearly 300 species, makes a long list, the mere detailing of which would take some pages, while anything like systematic treatment, with specific or even generic description would require a volume; it would, besides, be more than tedious—it would be deadly dull. Henshaw's check-list makes about as inspiring reading as the list inspired of Walt Whitman's poems, and for the same reason—it's a mere catalogue. There are purple patches, I grant you, and not a few in LeConte and Horn or in Blatchley as there are in Professor Wickham's papers on the Chrysomelidæ of Ontario and Quebec (contained in volumes 28 and 29 of the Canadian Entomologist, 1896–7). What are these purple patches of interest?—these oases in a desert of dry description? At first sight they seem of varying nature; sometimes a brilliant generalization or an ingenious analogy; at others a quaint observation of habits or a personal experience. But they all resolve themselves, at last, into the personality of the writer. It is the personal element that lends interest to a book or a paper on a technical subject; it is just

this that makes the old-fashioned Lexicon of Samuel Johnston or Noah Webster an enthralling romance beside a modern dry-as-dust scientific work-of-a-syndicate like the Standard Dictionary.

It would obviously be impossible to write an interesting account of 264 species of beetles or even of 96 genera, but for the convenience of systematic treatment, this enormous mass of individuals, countless as the sands of the sea, has been marshalled, like the children of Israel, into 12 tribes, and every one of these tribes has several representatives in Ontario. In our day's tramp we shall run across at least one representative of each tribe, from Reuben the first born to little Benjamin, our ruler; in plain terms, from Donacia, the reed beetle, cousin german to the more ancient Cerambycidæ, to Chelymorpha and Coptocycla the little Tortoise. Of these twelve tribes, the most numerous in boreal America, as well as the most important, are the five numbered VI–X. These comprise more than 450 species out of a total (to the family) of less than 600 and more than 70 genera in a total of about 100; i.e., ¾ of the entire genera and species belong to five consecutive tribes out of the twelve. Of these five tribes, again, two are supreme, the 9th and 10th included by LeConte and Horn in the single tribe of Galerucini or Helmet-grub beetles, with a total of more than 200 species and over 40 genera; i.e., nearly half the family.

In the tropics, where vegetation is most luxuriant, these beetles play an important part in checking the too-lavish growth; but in the Temperate Zone, where civilized man has brought the earth under cultivation, these twelve tribes, the chosen people of my paper, are nothing better than one of the plagues of Egypt, a most distinctive pest, and man's best wits are taxed to prevent an annual loss of many million dollars.

The Chrysomelians represent a later development than the Cerambycidae or wood-borers, and their adaptation to succulent herbage and the deciduous foliage of flowering plants pari-passu, with changes in the vegetable kingdom from sporophytes and gymnosperms, presents in its way as wonderful an illustration of adaptive development as more specific examples like symbiosis which has isolated the Yucca and its moth from all creation, till each depends on the other for its very existence and on the other only.

The larvæ of the Chrysomelians are in general soft and helpless; feeding, as they do, in the open and gregariously, they are easily destroyed; but several factors contribute to their notable success in the struggle for existence: their immense numbers, the rapidity of their growth (which enables them to produce more than one brood in a season), and the ability of the mature insect, in most cases, to hibernate.

A few of them retain traces of an earlier condition in being stem-borers, or in tapping the roots of plants, as the Donacias; and it may be a sort of atavism that impels Cryptocephalus and Glyptoscelis to resort to the needles and bark of white pine.

Our train is now slowing down to let us off at Quay's Crossing, and for the rest of the day we'll have to put our best foot forward, for it is going to be Shank's mare with us. First we go a quarter of a mile east to Mose Robinson's mill-pond and Pine Grove School-house. Just after crossing the stream here we turn south down a grassy lane, flanked on the west by an old snake fence and on the east by a still more ancient stump-fence; the snake fence appears to spring from a bed of fern-oak and brittle bladder. The lane is filled with sweet-briar and the stump fence festooned with wild grape-vine; a fortnight ago the briar and the grape-vine were both in bloom and the lane was redolent with two of the most delicious scents on earth. A little way on, at the foot of a sandy slope, we cross a tiny brook of lovely, cool spring water, its surface mantled with water-cress. Here in the early season, as early as April, are nearly always to be found about the grass-blades, some specimens of the Donacia. This is our representative of Tribe I, a small tribe generically, consisting of two members only; the genus Hæmonia has only one species, but the Donacia (Reed-beetle, as the Greek name implies) has more than 20 species in North America. The kind I have found here is much like a Longicorn, and in early days was mistaken by me for a member of that family; it differs from the Chrysomelians in being long and narrow in shape, usually yellowish brown in colour and of a metallic lustre. The larva feeds about the roots and bases of aquatic plants and has acquired the power of living under water by tapping the air-vessels of its food-plant. It has actually a small process on the body which it uses as a probe. When about to pupate, it encloses

itself in an air-tight cocoon which is fastened to the roots or stems of the food-plant beneath the surface. The beetle is covered on the under side with a pubescence that acts as a perfect aquifuge shedding the water like oilskin. The species found here in the cool days of April is more or less cylindrical (convex on the upper side) and quite sluggish in habit, but the Donacia of the dog-days in the height of summer is a very different creature. I well remember during my first visit to the Algonquin Park how one day I went over with the late Dr. Brodie to the little land-locked Cranberry Lake in the heart of the hardwood forests. It was a glaring hot day, with the sun at its height and perfectly calm. We rowed a boat down to the Cranberry marsh at the foot of the lake, where all sorts of botanical treasures awaited us. On the way we passed through a patch of water-lilies and flushed a covey of Donacias; there must have been hundreds, leaping and flying from the lily-pads, striking the sides of the boat, sometimes in the water, occasionally on our clothes, darting and glittering in the sun like sparks from the molten surface of the cauldron of heat formed by this woodland lake at high noon beneath an August sun. The activity of movement and extraordinary vitality in the sun's heat are not common among the Chrysomelians, but they are among some of the Longicorns, with which the Donacias have a close affinity. Lords, for the nonce, of all three elements, earth, air and water, they moved easily about all three, perfectly at home and at their ease. On cooler days, or when the breeze blows, they love to sit on their beloved lily-pads, like miniature batrachians, their thorax and head partly raised and their antennæ thrust forward alertly, something like the asparagus beetle when it scents danger.

We shall now stroll south about a mile, along the edge of a wood we call the North Wood, a wood sacred by many memories, rich in flowers, the home of some rare orchids, in and about which I have found more than 20 species of ferns and a wide range of warblers and other birds at the spring migration; it is, besides, the scene of many of my best captures among the Coleoptera. Ten minutes' walk brings us to where the wood narrows close to a division fence, running west across meadow-lands to the railway. Just here stands, on the edge of the wood, a hawthorn, whose blossom, for some reason or other, has proved a beetle-trap or bait

for an extraordinary number of species. It was on this blossom that I first captured specimens of the Orsodacna, our representative of Tribe II, and on the top-rail of the snake-fence, beside it I took one of the few specimens I have ever seen of Syneta, another of the four genera contained in this tribe. The Orsodacna (or Bud-gnawer) is said by Blatchley to feed on willow-blossoms, and this season, as early as April, I was on the look-out for it about clumps of willows in bloom, but the only thing new to me that I observed was a small moth dancing up and down in lively zigzag flight over the willow bushes; it was almost as small as a clothes moth, blackish with a cream or white bar near the apex of the wing. From its extremely long hair-like antennæ I should judge it a species of Adela. We have but one species of Orsodacna, and I have always found it in great numbers, once here and once in Lakefield. The specific name is *atra* (black), but it is very variable, and specimens sent by me to Guelph, taken all at the same time off this hawthorn bush some years ago, were returned labelled under no less than four varietal forms. The pigmentation of the elytra, normally black, becomes less heavy and the wing-covers show light brown with darker disks and markings. In some of its forms the blend of colours is very pretty; the beetle is narrow-oblong and the texture of its upper surface is of an oily smoothness.

Let us cross the meadow west to the railway track; near the fence that extends from the hawthorn tree to the railway, on the south side are some sand-drifts where I have captured no less than six species of Tiger-beetle at various times in the season. The meadow to the north is less sandy and springs ooze out from its surface and meander over the grassy slopes. Here in September the meadow is white and fragrant with *Spiranthes cernua*, the nodding Ladies' Tresses, one of our autumn orchids. Just where we strike the railway is an immense patch of that rather rare plant, the Grass of Parnassus, whose green-veined creamy white blossoms in August and September make as brave a show as the anemone in June and July. It is a sure sign of springs in the soil and further south there are traces of an old sphagnum moss swamp; though it is years since the railway hacked away the trees and shrubs, marsh pyrola and the Showy Ladies' Slipper annually rear their upright

stalks and unfold their blossoms for gauze-winged visitors to gather nectar from beneath the July sun.

Here, along the right of way, grows wild Asparagus, and on it you will find at least one species of the Asparagus beetle, which we shall take to stand for Tribe III. The first specimens I ever saw of this beetle were in a Kentish garden; they belonged to the species commonly known as the striped asparagus beetle, and at first I did not recognize the insect—all I had by way of guide was an old book of Stevens with coloured illustrations that were several times magnified. The picture showed a gorgeous insect, in rich dark green and cream hues, which to my excited imagination must be nearly as large as a June Bug. I found ,however, to do the old naturalist justice, that though in the dead insect the sutural stripe, the basal marks and the cross-bar on the elytra appear black on a ground colour of opaque straw-yellow—in life these colours are a rich, vivid, dark green, on a ground colour of translucent cream, extremely beautiful when scanned with a lens. The 12-spotted species, which seems the commoner in Ontario and is apparently more hardy, I first found in the late Dr. Brodie's back garden in Toronto. Until five or six years ago neither species had made its way to Port Hope, but the spotted one appeared in several gardens then, followed a season or two later by the striped, and two seasons ago I first found the *Crioceris duodecimpunctata* on wild asparagus. There is only one other genus in this tribe—the Lema, of which there are no less than 16 species in North America, only a few occur in Ontario, and I have only found one—*Lema trilineata*, a beetle which sometimes shares with one of the Blister beetles the title of "the old-fashioned Potato Beetle"; it feeds on various plants of the Potato family, and I have found it in some abundance on the Physalus or Ground Cherry, while searching vainly for specimens of *Coptocycla clavata*, the Rough Tortoise Beetle. Before we leave the asparagus and return to our little brook a mile north, I may mention that it was on some garden Asparagus at Lakefield that I found my reward for a day's umpiring at a cricket match, in the shape of a beetle called *Anomoea laticlavia*. This is the only species in the IVth Tribe known to me; for though North America has seven genera in the tribe and over 20 species, there are but four genera represented in Canada, each by a single species.

It is, for a Chrysomelian, a decidedly large insect, stout and of striking appearance, light-brown in colour, with a black sutural stripe, which is slightly thickened from about midway down the elytra to near the apex. I have never since seen it on asparagus, but more than once I have taken it feeding in large numbers on willow-shrubs about the right of way, a few miles north of our present halting-place on the Peterborough railway. Last year I discovered it very abundant, almost a pest, on wild grape-vines near Sackville's Swamp, on the South Shore of Rice Lake, between Bewdley and Gore's Landing.

We now return to the little brook where our first Donacias were captured. Just over the fence, on our right hand, is a small pine wood, out of which, indeed, it is that our little brook emerges. This wood is a great place for early morels; it has also yielded some very interesting species of Longicorn and Clerid on the occasional windfall of white pine. Towards the north-east side of it, where our way lies, grows a patch of raspberry canes, where I captured once in full flight, with my hand, that most elusive of dodgers, the Oberea. On the leaves of the raspberry once I saw some tiny dark conical galls, as I supposed, and one of these I tried to tear from the leaf; to my surprise, when I had partly wrenched it aside, it distinctly moved and glued itself back on the leaf. This was something new for a gall, and I pulled it away from its fastenings to find that it contained a live larva, whose legs were kicking frantically to get back to the leaf. You have often seen a refractory man-child plucked suddenly up by the nurse from the place where it was playing? Well, that's how this caterpillar kicked. It was Chlamys, one of two genera that represent the Vth tribe. These insects construct a case out of their own excretions, and under cover of this tiny, steeple-crowned brownie's cap of a case they move about and feed securely; when the time comes to pupate, they simply close the door at which they have grazed and behold a ready-made cocoon. The insect itself is dark brownish black, and covered with little warty excrescences; when alarmed it closes its legs and falls to the ground, where it escapes notice entirely or is passed over by warblers and other insectivorous birds as a pebble or a pellet of dirt; one more instance of protective mimicry preserved in this creature through all stages of its existence. (To be continued.)

# APPLIED ENTOMOLOGY FOR THE FARMER.

BY F. M. WEBSTER, WASHINGTON, D.C.

Of all husbandmen, the true farmer, the grower of grains and forage crops for sale or consumption on his premises, has been the last to profit by the applied science of entomology. He in the past has indeed supposed himself as helpless against the inroads of insects upon his crops as the Indian squaw whose only hope of saving her patch of Indian corn was in the effect of charms and incantations in warding off attacks of wireworms, cutworms and perhaps other similar pests.

The beginnings in applied entomology consisted in dusting garden vegetables with soot, lime, ashes, and, somewhat later, with powdered hellebore. But to the farmer these precautions meant practically nothing. Though his farm might not be a large one, the area was usually too wide to render these measures practicable, even if they proved effective in a small way. It is true that the trapping of cutworms under compact bunches of elder sprouts, milkweed, clover and mullen, "placed in every fifth row between every sixth hill," was known as early as 1838, but these constituted only a trap or baits, the worms found under the traps being killed by some sharp instrument. This measure, however, seems to have never become popular.

The spread of the so-called Colorado potato beetle over the country from the west eastward brought the use of the Paris green and London purple as insecticides to the front, but, again, this did not help in the least the troubles of the ordinary farmer.

The work of Riley, Packard and Thomas, on the western migratory locust, was the first important effort made to aid the farmer in devising practical measures of fighting destructive insects over large areas.

The spread of the cabbage butterfly from the east to the westward brought into use as an insecticide the powdered blossoms of Pyrethrum, but the farmer does not raise cabbage as either a grain or a forage crop.

Studies of the cotton-worm, by Riley and others, brought Paris green again into use and developed that useful insecticide,

kerosene emulsion, but the farmer cannot make use of these in his cultivation of wheat, oats, corn, rye or barley; neither can he apply them to insect pests on his broad acres of forage crops.

In the same way, fighting the codling moth and San José scale have developed the use of arsenical sprays, as well as those of lime and sulphur, crude petroleum and other sprays and washes. But none of these are of the slightest use to the farmer in his fields, no matter how valuable they may have been to the fruit grower.

The farmer has, therefore, largely occupied the position of a skeptical spectator, who, while seeing clearly the benefits derived from applied entomology by his brother husbandman, the fruit grower, the gardener and even the cotton planter, was seemingly himself debarred from sharing in these benefits, because of the measures being inapplicable to his crops, and, even if this were not the case, his wide areas would render their use impracticable.

Besides all this, the farmer has, himself, held somewhat the position of a critical onlooker as the result of other causes.

Before the advent of experiment stations, and even for some time afterward, letters addressed to the members of university faculties, complaining of the ravages of insects and asking relief, brought the actual farmer little consolation. The replies he received to his appeals for relief were usually couched in terms to which he was unused and much of the text of these replies in a language that he did not understand. Moreover, the replies were usually penned by men who had little or no practical knowledge of agriculture, and thus there grew up between the two not only a continually widening breach, but in many cases an absolutely intolerant feeling on the part of each for the other.

This was approximately the relative positions of the man from the campus and the man from the farm, at the time of the establishing of the Experiment Stations, though there were, of course, some brilliant exceptions. Besides this, many, probably the majority, of those who were afterwards to make the Experiment Stations a success, were yet to be trained and given their practical experience in combining the practice and science of agriculture; and it may be stated that the science of entomology, for reasons previously given, has impressed the farmer the least favourably. Farmers

had always looked upon insect depredations precisely as they did other natural phenomena like drouth, storms and floods, fully convinced by ages of experience that nothing could be done to prevent them, and, therefore, they must be endured to the end. Entomological literature, however elementary and popular, they simply would not read. This was, generally speaking, the situation at the time when I was just beginning my entomological work among the farmers of Illinois.

We will now step over the intervening 25 years and look at the situation as it is to-day. It will be an obscure section of the country, indeed, if where there are serious insect depredations going on, we at the Department of Agriculture do not promptly receive a report of it through one or the other of several sources. These reports are received through letters addressed direct to either the Department or Bureau, and are coming each year with increasing frequency, through experiment stations, the press, and last, though not least, through members of Congress.

Perhaps nothing better illustrates the changed condition and rapid growth of agriculture as a science than the immense strides made by economic entomology as applied over and throughout the broad acres of the ordinary farmer. At the present time, instead of receiving a stereotyped reply to his applications for relief, when he applies as an individual, or for his neighbourhood, to the Department of Agriculture, either directly, or, as is becoming every day more frequent, through his representative in Congress, he is very often surprised when, within two or three days after the receipt of his complaint, there appears in his neighbourhood a young man who, in most cases, has grown up a farmer's son on the farm, and, besides this, has had a thorough university training, and, perhaps, is further equipped by having been engaged in the investigation of insects over a wide range of country, including, perhaps, no small number of the United States. Instead of receiving a letter which to him might, perhaps, so far as practical aid is concerned, have been written in a foreign language, he finds that his visitor can go about over his and his neighbours' farms with him and with a clear understanding of the crops cultivated can point out the work of insects and tell then in what manner they might have avoided these injuries and saved their money. He

will tell him of things that, though he may have spent a life time in farming, neither the farmer nor his neighbours have ever yet been able to observe. His caller not only fits into their farm life and speaks to him in the language of the farmer, but is able to explain, in a perfectly natural and intelligible way, much of what to him has heretofore been a mystery. The young man points out to him wherein their farm methods have, in many cases, been primarily responsible for their previously sustained losses by insect attack. The farmer is now in a position to read entomological literature intelligently and with pleasure to himself. It does not greatly matter of what State he may be a resident, if his locality is not too inaccessible and the matter is of more than local importance any of the men located at the fifteen different field stations can be wired instructions that will send them to his relief. In this way entomology as applied to the broad acres of the farm has within the last twenty-five years become completely revolutionized. This means much to the growers of grains and forage crops and to the stock breeder. Moreover, it means almost equally as much to the banker, the manufacturer, and the merchant, all of whom are coming to recognize the fact. It has been my own practice to take up only such investigations as involve several States, leaving local matters to State institutions, where such are equipped for the work, and, when called upon to deal with such, I have urged that the State be at least given an opportunity to help itself, while we stood ready to reinforce their efforts if need be. This course has been followed especially with reference to local outbreaks of grasshoppers. Where investigations can be carried out in any State, as a part of an extended plan of work, notably that of wheat sowing in fall to evade the fall attack of Hessian fly, we have carried out such experiments with the co-operation of farmers at whatever points seemed most desirable for obtaining results which would benefit the greatest number of farmers. In many cases these sowings have been also made in co-operation with State institutions. The alfalfa weevil investigations have been carried on in co-operation with the State agricultural college and station at their request.

Besides the field laboratories there are being carried on field experiments, out on the farms, under precisely the same conditions

as those with which the farmer has himself to meet. These experiments are conducted in such a way that farmers can see just what is done, how it is done, as well as the object of the experiment itself. They can also see what results are obtained, and what we have done, under their conditions, they, under like conditions, can do for themselves; and the proof thereof is right before their eyes in their own fields. We find that these object lessons and personal contact are primarily worth vastly more than whole volumes of literature, and, gradually the farmer is coming to learn that there is help for him as well as for the horticulturist, in combatting insect pests, even though his acreage may be many times theirs and his crops radically different in nature.

## ILLUSTRATED LECTURE ON "ANTS" (ABSTRACT).

BY PROF. W. M. WHEELER.
Bussey Institution, Forest Hills, Mass.

By way of preface the lecturer made some general statements in regard to the 5,000 known species and sub-species of ants, described the development and metamorphosis of the individual ant, the various castes, or polymorphic phases represented by each species and the function of each of these castes in the life of the colony. Then the general behavior of ants was treated from the standpoint of the three basic biological activities, namely reproduction, nutrition and protection.

Special emphasis was placed on the behavior of the female, or queen ant and her methods of establishing the colony in contrast with the behavior of the queen honey-bee and with the male ant, which takes no part in the activities of the colony as such, but functions only as a fecundating agency during the nuptial flight. The queen ant was shown to possess all the instincts of the worker forms in addition to some of her own and thus to represent the most complete embodiment or epitome of the species. This statement requires qualification only in the case of certain parasitic and slave-making species, in which the queen is degenerate like the queen honey-bee and no longer able to establish a colony and bring up the first brood of her offspring without the aid of workers either of her own or of an alien species.

November, 1913

The peculiar structure of the ant's alimentary track was described in some detail, with its "social" and "individual" stomachs, which enable the insects not only to store their liquid food in the most economical manner but also to distribute it equally among the various members of the colony both larval and adult. For the purpose of illustrating this portion of the lecture more fully, the various adaptions of ants to living in very dry regions, such as deserts, were examined, and it was shown that these insects have evolved four very different methods of circumventing the difficulties inseparable from life under conditions that imply a great scarcity of their natural insect food. A certain number of species have exaggerated their primitive predatory instincts and have become rapacious hunters (e.g. the species of *Cataglyphis* in the North African deserts). Others have taken to storing quantities of liquid food in the crops, or social stomachs of certain workers of the colony for the purpose of tiding over the long droughts (e.g. the honey ants of the South-western States and Australia belonging to the genera *Myrmecocystus*, *Melophorus*, *Camponotus*, *Leptomyrmex*, etc.). Other species have become agricultural or harvesting ants (the species of *Messor*, *Pogonomyrmex*, many species of *Meranoplus*, *Pheidole*, *Solenopsis*, etc.), and have therefore become addicted to a vegetable diet. These forms store the seeds of various desert plants in their nests. Lastly, a group of American ants, comprising the species of *Atta* and allied genera, has learned to grow fungi for food on pieces of leaves, caterpillar excrement or other vegetable detritus. Although this habit seems to have originated in the moist woods of South and Central America, several of the species which acquired it were able by its means to invade the deserts of the Mexican plateau and of the South-western States and thus to remain independent of the precarious supply of insect food peculiar to those regions. This represents the most specialized stage of ant dietetics.

The protective instincts of ants, apart from their stinging and biting proclivities, attain their most striking expression in the construction of the nests. The various types of these structures were briefly considered: the small crater nests in the soil, the nests under stones and in wood, the larger mound nests, which are characterized by a superstructure of accumulated vegetable

detritus which is used as an incubator for the larvæ and pupæ, the carton nests constructed in trees by various tropical ants of the genera *Crematogaster*, *Azteca*, *Dolichoderus*, and *Polyrhachis*, and the extraordinary silken nests of *Oecophylla smaragdina* and some species of *Polyrhachis* and *Camponotus*, which are woven by the ants using their spinning larvæ as shuttles.

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## THE EXCURSION TO GRIMSBY.

In accordance with the prearranged programme, the visiting entomologists were all invited to participate in an excursion to the town of Grimsby, which is situated near the centre of the chief peach district of the Province. About thirty-five availed themselves of the opportunity. It had been expected that the party would arrive in Grimsby soon after noon, but owing to a very severe thunderstorm the previous evening, the electric cars were running irregularly and it was not until about 2 p.m. that we arrived there. Lunch was at once served. After lunch there were two or three very interesting, short addresses of appreciation of the pleasant trip and of the entertainment. Immediately afterwards those who were enthusiastic collectors set out in a body to search the flower-clad side of the so-called mountain for their favorite kinds of insects. The remainder, under the guidance of Mr. Caesar, visited the neighboring orchards, especially the peach orchards. Fortunately the peaches were just ready to pick, and the healthy trees, with their luxuriant green foliage and the branches bending down almost to the breaking point with the weight of golden fruit, aroused the enthusiasm and admiration of those who had never before seen an Ontario peach orchard. About two hours were spent driving through or past peach and other orchards, noting at the same time a few of the special insect pests of the locality, and then all returned to the hotel to meet the party of collectors who reported a considerable number of interesting captures. Farewells were given and the convention was at an end.

L. C.

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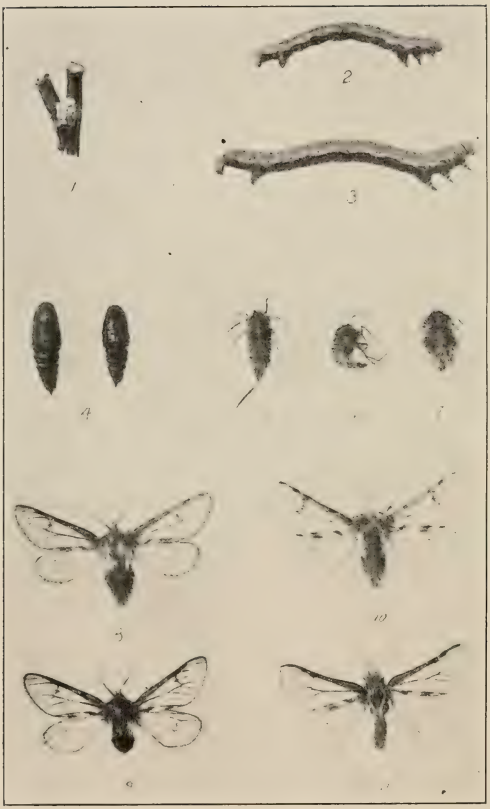
Rev. Dr. C. J. S. Bethune, who has been suffering for some years from defective eyesight, recently underwent an operation, which has completely restored the sight of his right eye. We offer him our heartiest congratulations, and feel sure that the news of his recovery will be received with pleasure by all readers of The Canadian Entomologist.

Mailed November 18th, 1913.



APOCHEIMA RACHELAE, HULST.

The Canadian Entomologist.

VOL. XLV. LONDON, DECEMBER, 1913 No. 12

# THE PREPARATORY STAGES OF *APOCHEIMA RACHELÆ* HULST.*

BY ARTHUR GIBSON, DIVISION OF ENTOMOLOGY, OTTAWA.

A cluster of about 200 eggs of this rare moth was received from Mr. Norman Criddle in 1903. Oviposition took place at Aweme, Man., during the nights of April 20, 21 and 22, and the larvæ hatched at Ottawa on May 9 and 10.

To the notes made in 1903, further information has been added from a recent study of inflated larvæ.

*Egg.*—The eggs were laid in an agglutinated mass and when received (May 1) were yellowish in colour. On May 6-8 they turned pinkish, then black, and before hatching were beautifully iridescent. In shape, the egg is oval; height 0.6 mm.; breadth 0.3 mm.; the whole surface roughened.

The eggs were secured by confining the female moth in a collecting net-bag. Since, however, Mr. Criddle has found eggs under natural conditions, viz., on a twig or poplar (see figure 1, plate XIV) these had been deposited in a tightly compressed mass. On another occasion, a female which the same observer had in confinement laid the eggs in a cluster on her own body.

*Larval Stage I.*—Length 2.5 mm. Head 0.4 mm. wide, somewhat quadrate in shape, slightly depressed at vertex; dull black in colour, mouth-parts reddish brown, ocelli black. Body velvety black, with five transverse bands of white on abdomen; collar and stigmatal stripe white; thoracic feet black; prolegs concolorous with body.

*Stage II.*—Length 6 mm. Head 0.7 mm. wide, blackish brown, with conspicuous whitish patches, giving a mottled appearance; the lower half of clypeus and lower portion of epicranium reaching to ocelli, almost wholly whitish in some specimens; in others the front of head is mostly whitish, with a few dark brown spots on clypeus and inner margins of cheeks. The larvæ are now of a grayish-brown colour, with whitish longitudinal lines and

*Contributions from the Division of Entomology, Department of Agriculture, Ottawa.

streaks. Anterior third of thoracic shield mostly white. Transverse whitish bands on dorsum not so conspicuous as before. Tubercles on body blackish; setæ short; blackish.

*Stage III*—Length 13 mm. after moulting. Head 1.1 to 1.3 mm. wide, which now may be described as white, mottled with conspicuous dark brown, irregularly-shaped spots, mostly present on upper two-thirds epicranium. Body now pale mauve, above spiracles, venter darker, the whole skin marked with many black spots and streaks. The longitudinal stripes on the body indistinct, except three pale yellow stripes on venter, which are more apparent owing to the darker colour of the under surface of body. The transverse bands on dorsum are irregular and broken and in colour pale yellow. Stigmatal band whitish, blotched with yellow, broken, irregular, bordered with a wide blackish band beneath. Spiracles blackish. Thoracic feet dark brown, or black; prolegs concolorous with venter.

*Stage IV* (Fig. 2, plate XIV).—Length 21 mm. after moulting. Head 2.0 to 2.2 mm. wide. This stage is much the same as stage III, but the longitudinal stripes are now all yellow, and the skin is not so heavily marked with black spots and streaks. Transverse dorsal bands on abdominal segments as before. The lower joint only of each thoracic foot is now wholly black, the other joints being mostly white, banded above with black.

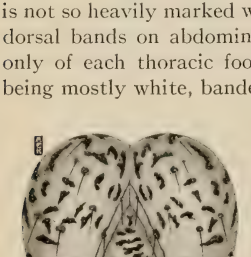


Fig. 15.—*Apotheima rachelæ*, head of mature larva (X 33).

*Stage V* (Fig. 3, plate XIV).—Length 26 mm. after moulting. Head (fig. 15) 2.9 to 3.2 mm. wide, slightly indented at summit, flattened in front; whitish with yellowish tinge; mottled with brown as before; margined behind with black. Larvæ cylindrical in shape, and, in general, the same as Stage IV. Just after moulting the longitudinal stripes are plainly visible; as the larvæ grow these markings become less discernible. When mature and ready to pupate, the larvæ may be described as pale mauve or pale yellow—the colour varying in the specimens—with numerous irregularly-shaped streaks and spots of brown, venter darker; the markings on the dorsum not so heavy as in previous stages. Tubercles black, very small, of

equal size; on segments 5 to 9 inclusive, tubercle iii is slightly above, and anterior to, the spiracle; iv is behind and almost in a line with the lower end of spiracle; v is below, and slightly anterior to, spiracle; same distance therefrom as iii. On segments 10 to 12, however, tubercle v is immediately below the anterior side of spiracle. On segment 12, tubercle iv is also below the spiracle. Spiracles black, oval in shape. Stigmatal band whitish, blackish border beneath irregular and not so conspicuous as in previous stage. Thoracic feet and prolegs as in Stage IV.

On June 4 some of the larvæ were mature and entered the earth for pupation. On this date they were 39 mm. in length and 4.5 mm. in width.

*Pupa* (fig. 4, pl. XIV).—Length 14-16 mm., 4.5-5 mm. in width at widest part; shining, reddish brown, thorax and wing-cases wrinkled. Abdomen moderately punctured, abdominal fold densely, very minutely, punctured in concentric rows. Spiracles black. Cremaster dark brown, bearing two divergent, almost straight, stiff, spines; close to the base of the cremaster there are also two, short, thick, blunt, spiniform protuberances, one on either side.

Most of the moths emerged (in a cool cellar) in the end of April and early in May, 1904. A breeding jar containing some of the pupæ was kept in the laboratory and in this moths emerged in January. Males and females were kept alive and in one instance, on January 9, a male and female mated and remained *in coitu* for 30 hours. In the wooden box in which the moths were confined there was an open crack in the bottom, and when the box was moved on January 11 it was noticed that the female had inserted her long ovipositor through the crack and laid eggs on the underside of the bottom close to the crack, the bottom of the box being slightly elevated above the lower edge of the sides. The ovipositor of the moth (fig. 16) measured in one instance 7.5 mm. in length; near and at the tip it is distinctly pilose, the hairs being slender and of varying lengths.

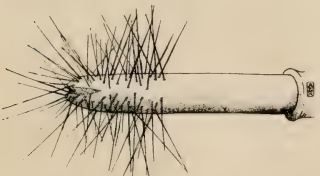


Fig. 16.—*Apocheima rachelæ*, ovipositor, showing arrangement of hairs near the end (X 19).

From the fact that these female moths have such remarkably long ovipositors, it would seem strange that they should deposit their eggs openly, as indicated on the plate herewith. One would naturally expect that the eggs would be laid in crevices, or other recesses. Further observations on the egg-laying habits of the species are most desirable.

The captured females which we have vary in size from 11 mm. in length, by 4 mm. in width (at widest part) to 16 mm. in length by 6 mm. in width. Scales on outer half of rudimentary wings mostly reddish ochreous, remaining scales black. A sprinkling of reddish-ochreous scales also occurs on sides of thorax and abdomen and a conspicuous cluster on summit of head. A distinct dorsal band of these scales is present on thorax and abdomen. Balance of body, black, clothed with long, grey hairs. Antennæ filiform, black, hairy. Legs hairy, tarsal claw brown.

*Food Plants.*—The larvæ were fed on aspen (*Populus tremuloides*) and cottonwood (*Populus deltoides*). At Aweme, Man., the larvæ have frequently been collected by Mr. Criddle from aspen and also from several species of willow; on one occasion he found a larva about two-thirds grown on elm.

*Distribution in Canada.*—In Alberta males have been collected at Head of Pine Creek, April and early May (F. H. Wolley-Dod), Millarville, May 9 (A. F. Hudson); High River, March 12 (T. Baird) and at Edmonton, May 12, 1896 (F. C. Clare); in Saskatchewan; Saskatoon, April, 1913, and Regina, April 23 (T. N. Willing); in Manitoba; Rounthwaite, April 15, 25 (L. E. Marmont), Aweme, April 18-27 (N. Criddle); Winnipeg, April 29 (Hanham).

The photograph from which the plate was made was taken by my colleague, Mr. F. W. L. Sladen. Figs. 12 and 13 in the text were drawn by Mr. A. E. Kellet, artist assistant in the Division.

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EXPLANATION OF PLATE XIV.

*Apocheima rachelæ* Hulst.

(All figures natural size).

1. Egg cluster on poplar.
2. Larva, Stage IV.
3. Larva, Stage V, mature.
4. Pupæ.

5. Female moth, bred specimen showing extended ovipositor.
6. Female moth, bred specimen, side view.
7. Female moth, specimen found on poplar.
8. 9. Male moths; bred specimens.
10. Male moth, collected at Winnipeg, Man.
11. Male moth, collected at Aweme, Man.

## SOME PARASITES OF SIMULIUM LARVÆ AND THEIR POSSIBLE ECONOMIC VALUE.*

BY E. HAROLD STRICKLAND, DIVISION OF ENTOMOLOGY, OTTAWA.

During a year's residence at the Bussey Institution of Harvard University, in 1911, the writer had an opportunity of studying the Simuliid larvæ which abound in the streams of that locality. This study revealed the fact that a large percentage of these larvæ are attacked by parasites, the presence of which appears to result, in all cases, in the death of the host. Simuliid larvæ are most abundant in these streams from early March until May. Isolated specimens are found from then onwards till October, when other species occur in considerable numbers upon the rocks and vegetation in rapidly flowing parts of the streams.

A brief resume of the peculiarities in structure and habits of these interesting larvæ will be of advantage here, as their curious modifications have a very direct bearing upon their liability to parasitism.

The larvæ are to be found either solitarily or gregariously, according to species, attached by means of a caudal sucker to stones or vegetation, only in the fastest flowing water. Silken threads secreted from the salivary glands act as anchor lines, holding the larva in a vertical position, and retain a hold upon the support should the caudal sucker become detached. The cylindrical head bears on its anterior border two fan-like organs carried on elongate pedicels. When expanded, these fans form two very efficient bowl-shaped strainers, through which the water flows. They can be closed at will, and brought over the mouth orifice, carrying with them the small particles of vegetation, and diatoms which constitute the food of the larvæ. Since Simuliid larvæ,

*Contributions from the Division of Entomology, Ottawa.

December, 1913

unlike those of most Nematoceran genera, live entirely, and continually, below the surface of the water, they are apneustic, and all of the oxygen they require has to be extracted from the water through three supra-anal finger-like gills. The relatively small size of these accounts, in all probability, for the necessity of these larvæ living in fast flowing water, for when they are placed in still water they soon die, presumably of asphyxiation.

In maturing larvæ the histoblasts of the pupal and adult organs are well developed and most conspicuous. Thus on each side of the thorax can be seen the three leg-, the wing-, and the halter-histoblasts, as distinctly limited whitish areas. The pupæ of these flies resemble the chrysalids of the Heterocera with the exception of having all the spiracles closed, and the respiratory function being accomplished by a tuft of respiratory filaments situated on each side of the prothoracic region. These project far out of the slipper shaped cocoon in which the pupal stage is passed. The histoblasts of these filaments turn black in the later stages of larval development, and when the latter assumes the chestnut brown colour of maturity they appear as a black triangular area on each side of the prothorax.

The commonest Simuliid around Boston, in Spring, is *Simulium hirtipes*. In the larva of this species two classes of parasites occur. One of these is represented by a nemathelminth worm, belonging to or near the genus *Mermis*. The worm lives either singly, or in considerable numbers, coiled up within the body cavity of its host, where it occupies the ventral portion of the somewhat swollen abdominal region (Pl. XV, fig. 1). When one worm only is present it measures about three centimetres, which is nearly three times the length of its host. The greatest number of worms found in a single larva was twelve. In this case none attained to a greater length than 1 cm. The most striking effect of these parasites upon their larval host is that they so far inhibit the development of the histoblasts that pupation becomes impossible (fig. 2). This suppression of pupal and adult organs is accompanied by a slight increase in the size of the larval tissues, for most parasitised larvæ were from 2 to 3 mm. longer than their healthy companions. This condition is opposite to *Prothetely*, which name Kolbe ('03) ascribed to the several recorded cases in which larvæ of various orders had their

histoblasts so accelerated that the pupal, or in some cases adult, organs appeared as external structures in the as yet immature larvæ. Such cases have been recorded by Heymons ('96) in *Tenebrio molitor*, Hagen ('72) in *Bombyx mori*, and others in various Coleopterous larvæ. A study of the cases of prothetely now on record shows that they were all produced under artificial conditions. This would suggest that it is due to some pathological disturbance, which has caused an excessive stimulation of the enzymes, whose action brings about the multiplication of adult tissue forming cells, without appreciably affecting those of the larval tissues. It then follows that there are two sets of enzymes concerned in the maturation of holometabolic insects, one of which may be termed the "larval enzymes" and the other the "adult enzymes." The suppressed growth of the histoblasts in parasitised Simulidæ would then be due to the worm decreasing the stimulating action of the adult enzymes by impoverishing them either in quality or quantity. This subject is discussed more fully in an earlier paper by the writer ('11), where this pathological condition is termed Methetely, in contradistinction to Kolbe's Prothetely.

The parasitised Simuliid larvæ are unable to pupate and are finally killed by the worm, which bores its way out through the "skin" and thus escapes into the water. Here it probably leads a free sexual life, as do the related nemathelminths found in grasshoppers of which it is only the larvæ that are parasitic. It is surmised that the larval worm passes into the body cavity of its host from the alimentary tract, into which it would be readily taken with the food. This worm was found during the spring in varying abundance in most of the streams examined. The largest percentage of infection was 25, equally distributed between the two species of *Simulium* present in that stream. It was never found in the fall, and has probably one generation only per annum.

During the spring there was a very high percentage of parasitism by various Myxosporidia S. L. (Sporozoa). When these were discovered, they had all sporulated, and were therefore at too late a stage in development for their taxonomic position, or life history, to be ascertained, but they were evidently related to the organisms causing the Pebrine disease of silkworms. The body of the parasitised larva becomes enormously distorted and swollen,

particularly near the apex of the abdomen (fig. 3). The skin, normally dark green in colour, is rendered almost transparent owing to its great distension, and through it can be seen a white irregular mass of parasitic material. Upon dissection, this parasitic mass is found to consist of countless spores. Four distinct types of spores were found in different localities. These represented, probably four, or even more, species. The simplest type was a plain ovoid, about 5$\mu$ by 3$\mu$ in size. Another, similar in size, had at one end a flattened disc. In a third, this disc was replaced by a stout flagellum-like organ about 2-3 times the length of the spore, while the fourth resembled the third, but had in addition two raised annulations around its equatorial region. The first type of spore represented, probably, a normal species of the genus *Glugea*, of which three more species were found during the following fall. Unless the spores bearing appendages belong to the Myxosporidia, S.S., which seems to be improbable, they represent entirely different types to anything previously described. Up to 80% parasitism was recorded, every case of which is believed to have been fatal. This could not be proved definitely since all Simulium larvæ kept under observation in captivity died. The following observations tend, however, to confirm this supposition. No pupæ containing parasites could be found, even where 80% of the larvæ had been infested. No reproductive organs were found in parasitised larvæ. There is very little fat body stored up in these larvæ. The voluminous proportions of the parasite would require an enormous rent in the ectoderm in order that it might escape, and were it to pass over into the adult it is inconceivable that the latter would be able to escape from the water when so hampered.

Throughout the summer isolated specimens of *S. bracteatum* were present in the streams. These were casually examined, but no parasites were found. By the beginning of October larvæ of this species were abundant. *S. vittatum* was represented, also, by a few specimens, and by the middle of November *S. hirtipes* was once more hatching out from recently deposited egg masses. The latter species seems to æstivate throughout the Summer, for no signs of it were seen between the end of May and the beginning of October.

The larvæ present in the streams during the fall months were

found to be parasitised with species of two distinct Protozoan orders—namely, Gregarinida and Myxosporidia S. L. The former was represented by a single species, the taxonomic position of which was not ascertained. Larvæ parasitised by this species were conspicuous in presenting a white speckling over the entire surface of the body (fig. 4). This, upon closer examination, was seen to be due to innumerable small globular cysts, measuring up to .25 mm. in diameter, which either floated freely in the blood, or were still attached to the original seats of infection. The tissues invaded were the ectodermal epithelium, the cells of the fat body and the layer of pigment cells which cover the nervous system in these larvæ. The sexual organs were never found in parasitised larvæ.

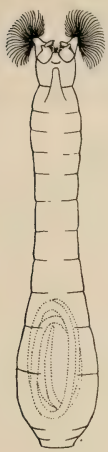
The cysts when sectioned, and stained with iron hæmatoxylin, were seen to be composed of a homogeneous mass of granular protoplasm, in which was situated numerous free masses of chromatic material. In some young cysts there were vacuoles, but these were detected in living specimens only. In other fresh material there seemed to be a distinct ectosarc layer of a perfectly clear fluid. By the end of November a developmental stage was reached in which the protoplasm began to collect around the scattered masses of nuclear material, and the cyst contents were divided up into numerous uninucleate globular bodies. If a cyst were then dissected and allowed to float in water it soon bursts, liberating countless numbers of these minute globules which, within a quarter of an hour of their escape, began to move independently,and were soon actively darting around, in a limited area, in the water. Killed and fixed specimens revealed the fact that each was provided with a flagellum. No further study of these organisms was made. The larvæ thus parasitised had their histoblasts retarded, though to a less extent than those which contained *Mermis* sp. Since this parasite was present in about 50% of the larvæ in streams where it was found, it must have a distinct economic value. The retardation of the histoblasts is sufficiently pronounced to assure the death of the larvæ, which was in all recorded cases that of *S. bracteatum*. No other species of Simulium larvæ were present however, in the streams where this parasite was found.

The order Myxosporidia S.L. was represented by three species of the genus *Glugea*. These species received special attention, and

their life histories were worked out. The appearance of parasitised larvæ was similar to that of the specimens, found in Spring, containing other Myxosporidia S.L. The life history of the organisms is, in brief, as follows: a *spore* is taken into the alimentary tract of a very young larva. From this escapes an amœboid *germ*, which passes between the cells of the mesenteric epithelium, and thus gets into the body cavity. Here it attacks, and enters, a cell of the fat body, where it grows with great rapidity, soon bursting the cell and living free life in the body cavity of its host. It is now termed a *trophozoite*, and consists of a multinucleated mass of protoplasm. As the trophozoite matures, a small clearly constricted globule of protoplasm collects around each of the numerous nuclei, to form a spherical *sporont*. The single nucleus of the sporont undergoes three (or more in some species) divisions, thus forming eight nuclei, which in time become the centres of eight small bodies known as *sporoblasts*. Around each of these sporoblasts is secreted a thick shell, which activity is accompanied by a complicated internal development. This converts the sporoblast into a mature *spore*, which is capable of spreading the infection, which liberated in the water by the death and subsequent decay of its host.

It is believed that infection by this class of parasite can be accomplished only in the earliest stages of larval life, before the peritrophic membrane lines the entire surface of the mesenteron. The latter, it would seem, is the only part of the alimentary tract which would not resist the attacks of an unarmed germ. A fuller account of this exceptionally stout peritrophic membrane, and its development, has been published by the writer ('13). In this paper, also, the three Glugeid species discovered as parasites of Simuliid larvæ were described.

It will be seen, from the above descriptions of the various parasites of Simuliid larvæ found around Boston, that they are very conspicuous, and would readily attract the attention of an observer. Notwithstanding this fact, there are no other records of their occurrence in North America. This would appear to indicate that, in those sections of the country where species of Simulium are most abundant, these parasites do not exist, for in these places careful studies of the larval stages have been made by several observers. A Glugeid was described from the European



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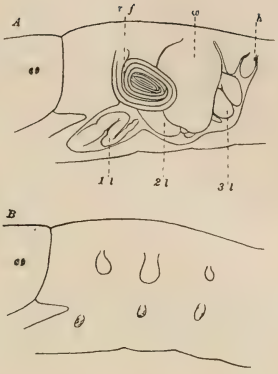


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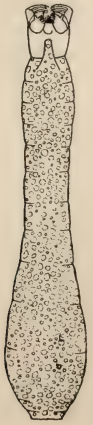

4.

PARASITES OF SIMULIUM.

*S. ornatum* by Leger ('97), and another from a Brazilian ? species by Luta and Splendore ('04 and '08). Lutz ('09) also records the presence of a nemathelminth in Brazilian Simuliidæ.

The parasites found in Simuliid larvæ around Boston during 1911 may be summarized as follows:

1. Parasites of the Spring brood of Simulium.
   Various Myxosporidia spp. up to 80% mortality.
   Mermis sp. up to 25% mortality.
2. Parasites of the Fall brood of Simulium.
   Glugea spp. up to 10% mortality.
   Gregarine sp. up to 50% mortality.

No experiments have been made upon the possibility of transferring these parasites from one species of Simulium to another, but so far as can be seen there should be no great difficulty in accomplishing this, for in all cases observed the parasites infected all species of larvæ present at the same time in the streams where the former occurred. There is, however, a seasonal variation of parasitism, for the species taken in the spring were not found in the fall, so that it is probable that only those species of Simulium whose life history coincides with parasitised species could be infected with the parasites of the latter.

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## Explanation of Plate XV.

Fig. 1. Mermis parasites in situ.

Fig. 2. A, normal histoblasts of mature larva. B, histoblasts of full-grown larva containing Mermis, sp.; r f, respiratory filament histoblast; w, wing histoblast; h, halteres histoblast; l (1, 2, 3), leg histoblasts.

Fig. 3. Glugeid parasite in situ.

Fig. 4. Gregarine in situ.

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## NOTES ON SOME SPECIES OF CECIDOMYIIDÆ.

BY WILLIAM BEUTENMULLER, NEW YORK.

*Dasyneura hirtipes* Osten-Sacken.

*Cecidomyia hirtipes* Osten-Sacken, Mon. Dipt. N. Am., Vol. I, 1862, p. 195; Glover, MSS. Notes, Dipt. 1874, p. 8; Bergenstamm and Loew. Verh. zool. bot. Gesell. Wien., Vol. XXVI, 1876, p. 47.

*Dasyneura hirtipes* Aldrich, Cat. N. Am. Dipt. 1905, p. 155.

*Male and Female.*—Head red, clothed with red scales; antennæ brown. Neck red; thorax above, smooth, polished, blood-red, blackish above with a few erect brown hairs, pleura marked with black; scutellum red. Abdomen bright scarlet red with blackish appressed scales. Legs wholly black; coxæ reddish. Wings with a dense blackish pubescence. Halteres reddish or orange, the club black. Expanse 5.5-6 mm. Length 3.5-4 mm.

*Gall.*—Polythalamous, large bud-like and solid when immature, with a number of aborted leaves surrounding it. When mature, it is soft inside and filled with a white foam-like substance, in which are a number of long, narrow, larval cells. When the flies are ready to emerge, the gall bursts open and it is then of the appearance of a miniature cauliflower; the large white center surrounded by the dark green leaves, giving it the appearance of that plant. Diameter 50 to 25 mm.

The gall is formed at the tip of stunted stalks of the fragrant golden-rod (*Solidago graminifolia*) in June and July. When old, the white foam-like internal substance decays and the gall is then hard, woody and hollow inside, with a large opening on top. It remains on the bushes in this state over winter. I have collected the gall of *C. hirtipes* at Fort Lee, New Jersey, late in June, from which the adults began to emerge on July 6.

*Dasyneura seminivora* Beuten.

*Cecidomyia* (?) *seminivora*, Beutenmuller, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 390, pl. XV., figs. 1-4 (larva and gall).

*Male and Female.*—Head and antennæ black. Thorax deep brown-black, somewhat shining, with erect hairs in the grooves; scutellum deep red. Abdomen deep red, covered with deep brown black scales above; under side wholly deep red with rather long, erect, dark hairs. Legs blackish above, pale brown beneath. Wings blackish hyaline with bluish reflection; extreme base of wings red. Halteres yellowish brown. Expanse 4 mm. Length 2 mm.

This species was heretofore known from the larva and gall only, and the adults are here described for the first time. The flies emerged from May 31 to June 15. The gall is a deformation of the seed-pods of certain species of violets.

*Lasioptera podagræ*, sp. nov.

*Male and Female.*—Head clothed with gray scales in front and behind; eyes black; antennæ deep brown, first and second joints dull red. Thorax narrowly banded on each side from the anterior portion of the scutellum, with gray and brown hair-scales. Along the middle of the thorax is a very broad golden brown band from the scutellum to almost the anterior portion. Scutellum marked with gray scales. Abdomen velvety black, with a row of large, broad gray marks on each side, decreasing in size toward the last segment. Under side: Thorax black marked with gray, abdomen wholly gray; legs black above, white on the joints, tarsi banded with white; femora beneath white from the base to about the middle. Wings hyaline with black scales, red at the extreme base and with a very small white mark at the middle of the costa. Halteres red or white. Expanse 2.50 mm. Length 1.50 mm.

*Gall.*—Polythalamous, consisting of an elongate swelling enlargement of the stems of a species of aster. Length 20 to 50 mm., Width 8 to 10 mm.

*Habitat:* Fort Lee, New Jersey; Bronx Park, New York City (W.B.).

*Types:* Collection Am. Mus. Nat. Hist.

*Lasioptera linderæ* Beuten.

*Lasioptera* (?) *linderæ* Beutenmuller, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 398, pl. XIV., fig. 3-6 (gall and larva).

*Male and Female.*—Head black, face and posterior portion snowy white; antennæ black, first, second and third joints white. Thorax velvety black, broadly bordered with white around the anterior portion to the base of the wings. In the grooves are a few scattered pale brown hairs. Scutellum black, with a few long white hairs. Abdomen black, first segment white, second segment with a small white mark on the dorsum posteriorly, the two following segments each with a broad white band posteriorly, the remaining segments wholly black. Under side of abdomen broadly white. Legs pale brown or sordid white; tibiæ marked with black at the middle. Wings hyaline with black scales and a white mark at the middle of the costa and at the base of the wings. Halteres white. Expanse 3 mm.

The adults are here described for the first time. They emerge from the galls in June.

*Lasioptera vernoniæ* Beuten.

*Cecidomyia* (?) *vernoniæ* Beutenmuller, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 389, pl. XV., figs. 7-8.

*Male and Female.*—Head white in front, black posteriorly; antennæ black; first and second joints white. Thorax deep velvety black, with a very broad white margin around the anterior portion to the base of the wings. In the two grooves of the thorax are a few scattered, white hairs. Scutellum scaled with white and with a few long hairs of the same colour. Abdomen deep velvety black, each segment with a very narrow white band posteriorly and not extending to the extreme sides of the abdomen. Legs black, with the joints pure white; coxæ white. Under side of abdomen broadly white. Wings blackish hyaline, with a white mark at the middle on the costa. Halteres white. Expanse 3.5 mm. Length 1.5 mm.

Heretofore, this species was known only from the larva and gall.

*Cecidomyia meibomiæ* Beuten.

*Cecidomyia* (?) *meibomiæ* Beutenmuller, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 390, pl. XV, figs. 9, 10, 11.

*Male and Female.*—Eyes large, contiguous at the vertex, black; face semi-translucent, dull orange red. Antennæ yellowish brown with erect black hairs. Thorax dull, semi-translucent red, with rather long, blackish hairs in the grooves on top, forming two parallel lines, and a few hairs at the sides; scutellum dull semi-translucent red. Abdomen dull semi-translucent, orange red sparsely, with brown black hairs; tip of abdomen blunt. Under side of body dull red. Legs fuscous. Expanse 3.50 mm. Length 1.33 mm.

Since my description of the larva and galls of this species I succeeded in breeding the adults from galls collected in the Valley of the Black Mountains, North Carolina, in September 1906, and they are here characterized for the first time.

*Cecidomyia clavula*, sp. nov.

*Female.*—Head black, eyes large, contiguous, face pale orange; antennæ pale, semi-translucent, orange yellow, banded with black, hairs gray. Thorax above semi-translucent orange, tinged with red; underside orange. Abdomen orange, with yellow hairs. Legs white, with deep black bands. Wings hyaline yellow, with metallic blue and purplish reflections; a broad, dusky grayish, wavy transverse band a little beyond the middle, followed by a similar close to the outer margin; on the outer margin is a grayish patch almost connected with the preceding transverse band; costa yellow, deep black below the apex; fringes yellow. Halteres semi-translucent orange. Length 2 mm. Expanse 4 mm.

Very closely allied to *Cecidomyia variegata* of Europe. Bred from enlargements of the terminal twigs of Dogwood (*Cornus florida*). It is the gall described by me in the Bulletin Am. Mus. Nat. Hist., Vol. IV, 1892, p. 269.

*Rhopalomyia remuscula* Beuten.

*Cecidomyia* (?) *remuscula* BEUTENMULLER, Bull. Am. Mus. Nat. Hist., Vol. XXIII, 1907, p. 392, pl. XVII, figs. 7, 8.

*Male.*—Head black; antennæ fuscous. Thorax shining black above, with two pale, parallel lines dorsally, pleura yellowish brown; scutellum yellowish. Abdomen dull yellowish, covered with brown hairs. Wings blackish, hyaline. Halteres yellowish, knobs black. Legs fuscous. Length 2 mm.

Hitherto known only from the gall and the larva.

## TWO NEW CANADIAN GALL MIDGES.

BY C. P. FELT, ALBANY, N.Y.

*Cystiphora canadensis* n. sp.,

The interesting midge described below was reared July 10, 1913, by Dr. A. Cosens, Toronto, Canada, from an inconspicuous flat, blister gall on the leaves of white lettuce or rattlesnake root, *Prenanthes altissima* or *P. alba*. This is the second American species of Cystiphora to be discovered and is easily distinguished from *C. viburnifolia* Felt by colorational and structural characters.

Gall.—Circular, diameter 5 mm., dark purplish with a paler center. There is no perceptible thickening of the tissues. The galls are placed irregularly between the veins.

Female.—Length 1.25 mm. Antennæ extending to the third abdominal segment, sparsely haired, dark brown; 13 or 14 segments, the fifth cylindric, with a length twice its diameter; terminal segment either simple or composed of two closely fused segments. Palpi: first segment irregularly capitate, the second subquadrate, the third slender, with a length fully five times its diameter. Mesonotum shining dark brown. Scutellum, postscutellum and abdomen mostly reddish brown, the terminal abdominal segment fuscous, the tip of the ovipositor yellowish. Wings hyaline, the third vein uniting with the anterior margin at the distal ninth. Halteres pale yellowish. Coxæ and femora basally, fuscous yellowish, the distal portion of femora, tibiæ and tarsi mostly fuscous; claws slender, toothed, the pulvilli as long as the claws. Ovipositor with a length nearly half that of the abdomen, the basal half distinctly swollen and rather heavily chitinized, the distal half with a diameter about half that of the basal portion, tapering slightly to a narrowly rounded apex bearing a slender spur. Type Cecid a2441.

*Hormomyia helianthi* Brodie

1894, Brodie, William—Biol. Rev. of Ont., I, pp. 44-46 (Cecidomyia).

1909, Jarvis, T. D.—Ent. Soc., Ont., 39th Rep't., p. 83 (Cecidomyia).

The axillary galls of this species occur on Helianthus. They are more or less cylindric, occasionally flask-shaped and, according

to the describer, have a length of 10 to 25 mm. and a diameter of from 1.5 to 5 mm. There may be 1 to 10 galls in an axil, firmly attached to the stem by an expanded base and projecting in various directions, usually upwards, often at right angles to the stem and occasionally downward. They occur on the upper third of the stems of *Helianthus decapetalus* and *H. divaricatus*, growing in open woods or in shaded situations. This gall occurs about Toronto, Ont., and has been collected at Evanston, Ill., by Mr. L. H. Weld. A species of Torymus has been obtained from this insect. Specimens of this midge were reared June 23, 1907, by Dr. A. Cosens, of the University of Toronto. The following descriptions are drafted from this material.

Male.—Length 2.5 mm. Antennæ probably extending to the fourth abdominal segment, sparsely haired, light yellow; 14 segments, the fifth binodose, the basal stem with a length one-half its diameter, the distal with a length about three-fourths its diameter, the basal enlargement subglobose, the distal subcylindric, slightly expanded apically and with a length nearly twice its diameter; three low, broad circumfili occur on each flagellate segment; terminal segment irregularly binodose, with an indistinct constriction near the basal third, the apex narrowly and irregularly rounded. Mesonotum yellowish brown. Scutellum and postscutellum fuscous yellowish. Abdomen dark yellowish brown, the genitalia fuscous yellowish. Wings hyaline, costa thickly haired, light straw, the third vein uniting therewith well beyond the apex, the fifth at the distal fourth, its branch near the basal half. Halteres, coxæ and femora basally yellowish, the distal portion of femora and tibiæ dark brown, the tarsi a little lighter; claws slender, evenly curved, simple, a little longer than the large pulvilli. Genitalia: basal clasp segment short, broad; terminal clasp segment stout, slightly curved and with a length thrice its diameter; dorsal plate short, very broadly and roundly emarginate, the lobes strongly divergent; ventral plate short, broadly rounded; style short, obtuse.

Female.—Length 3.5 mm. Antennæ nearly as long as the body, sparsely haired, light yellow; 14 segments, the fifth with a stem ¼ the length of the cylindric basal enlargement, which latter has a length 2½ times its diameter and three irregular, anastomosing circumfili on the basal portion of the enlargement, with a fourth

NEW NORTH AMERICAN ANAPHORINAE.

1. Pseudanaphora quadrellus. Type ♂.
2. Pseudanaphora quadrellus. Type ♀.
3. Neolophus antonellus. Type ♂.
4. Eulepiste antonellus. Type ♂.

apical filum; terminal segment slightly reduced, with a length about twice its diameter and tapering suddenly to an obtuse apex; the surface of this segment is nearly covered with very irregular, anastomosing circumfili. Palpi yellowish, basal segment roundly quadrate, the second segment reduced, conical. Mesonotum reddish brown. Scutellum brownish, yellowish apically, postscutellum brownish yellow. Abdomen sparsely haired, dark brown. Halteres and coxæ yellowish. Legs mostly yellowish straw. Ovipositor when extended about as long as the abdomen, the terminal portion moderately stout and with ndistinct, inarrowly rounded apical lobes.

This species departs from the typical Hormomyia in the greatly produced ovipositor of the female and it is possible that it, with related forms, should be referred to a distinct genus.

Type, C. a2453.

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## SOME NEW NORTH AMERICAN ANAPHORINÆ.

BY WM. BARNES, M.D., AND J. MCDUNNOUGH, PH.D., DECATUR, ILL.

In sorting over a large accumulation of material belonging to the Tineid group called by Walsingham *Anaphorinæ*, we discovered several species which did not agree with the descriptions of any known North American species; these we venture to describe as new. We have followed Walsingham in the generic references, although Busck states that these genera are not tenable; we feel, however, that Walsingham's genera serve at least to define the position of the species in the group rather more clearly than if we had employed a more general term.

*Neolophus antonellus*, sp. nov. (Fig. 3.)

♂.—Antennæ strongly serrate and fasciculate; palpi rough-haired, upturned to well above front and rather closely appressed, ochreous, deep brown at base; collar brown at base, ochreous apically; thorax brown centrally, this portion rather sharply defined by pale ochreous patagia with light brown center. Primaries light brown with broad, very prominent pale yellowish stripe from base of wing through the fold to approximately the end of cell; upper margin of this stripe is rather even, bordered by a black line which curves slightly upwards and ends in a black discocellular dot;

lower margin irregular, the stripe projecting slightly about center of wing in small quadrate patch towards inner margin, bordered basally with blackish and with brown patch beyond the projection; outer boundaries of stripe diffuse, two faint narrow black lines extending beyond it on each side of vein 4 to termen; slight sprinkling of gray scales above anal angle; costa and inner margin shaded with black-brown basally; indistinct series of marginal dots extending from costa before apex to anal angle; fringes brown, cut by ochreous. Secondaries smoky ochreous at base. Beneath smoky brown tinged with ochreous. Expanse 33 mm.

Habitat: San Antonio, Texas. 1 ♂. Type, Coll. Barnes.

*Eulepiste pyramellus*, sp. nov. (Fig. 4.)

♂.—Antennæ annulate; palpi rather smooth, upturned to above front, but not appressed; front pale ochreous, thorax darker; primaries an admixture of pale gray and brown scales, maculation very indefinite and indistinct, in well-marked individuals consisting of a brownish blotch in cell near base, another at end of cell and a third midway between these two above inner margin, these latter are at times connected outwardly by a whitish oblique waved line which is usually more or less obsolete; indistinct costal and terminal dark dots; secondaries and underside unicolorous smoky brown. Expanse 23 mm.

Habitat: Pyramid Lake, Nevada. 4 ♂. Type, Coll. Barnes.

The species appears to be intermediate between *hirsutus* Bsk. and *occidens* Bsk.

*Pseudanaphora quadrellus*, sp. nov. (Figs. 1, 2.)

♂.—Antennæ very slightly serrate below, palpi upturned, roughly haired, brown; thorax chocolate-brown; primaries chocolate brown shaded with pale ochreous especially along inner margin and termen; costa with alternate striæ of chocolate-brown and ochreous; slight ochreous tinge in cell; dark discocellular dash; inner margin broadly ochreous, more or less striate with brown, upper edge of the ochreous stripe irregular with prominent blunt tooth of ground-colour projecting downward towards middle of inner margin; before and after this tooth the margin is rounded, bent sharply upwards beyond origin of vein 3 as far as vein 7, bending again at right angles and attaining termen below apex, forming a large subquadrate terminal ochreous patch; faint ter-

minal row of dark dots; fringes checkered brown and ochreous with pale basal line. Secondaries pale smoky brown with ochreous terminal line and checkered fringes. Beneath smoky brown, costa of primaries apically ochreous with 3 or 4 brown striæ, narrow terminal ochreous line, secondaries and fringes as above.

♀.—Palpi short, hairy, porrect; primaries more uniform chocolate brown with only faint traces of ochreous along inner margin; a paling of the ground colour represents the quadrate terminal patch so prominent in the ♂. Expanse ♂ 25 mm. ♀ 28 mm.

Habitat: Palmerlee, Ariz. 7 ♂, 3 ♀. Types, Coll. Barnes.

The species is allied to *davisellus* Beut., but should be readily distinguished by the dark apex and subquadrate ochreous terminal patch with sharply defined inner edge. The males vary in the amount of brown striations on the ochreous area in some there are scarcely any, in others they show a tendency to obscure this area more or less completely.

## EUGONIA CALIFORNICA BDV. IN THE PACIFIC NORTHWEST.

During the summer of 1912 there was an unusual occurrence of the caterpillars of *Eugonia californica* in a number of places throughout the states of Washington, Idaho, and also British Columbia. They were reported as being present "by the millions" and defoliating the buckbrush or ceanothus (*Ceanothus velutinus*). It was even reported that the caterpillars were blocking the trains at Clayton, a village about 30 miles north of Spokane, Wash. This story was not exaggerated in the least, as I had occasion to ascertain.

On the 18th of June I visited the field of devastation at Clayton. When I first arrived at the place, I thought the caterpillars to be those of Vanessa antiopa, but such they did not prove to be. I saw that there were a great many of the caterpillars and started to step off the distance across the small area ahead of me, but I soon found that it was not a matter of yards or rods, but of miles. As far as could be seen to the westward, the ceanothus looked as if it had been scorched by fire. All the bright, green glossy leaves had been eaten, and the branches were entirely bare except for the millions of crawling, spiny, dark caterpillars. They were crawling

everywhere—on the ground, over sticks, stones, logs, stumps, up in the young pines above one's head, on the fence posts, up and down the timbers of railroad bridges, in the water, and even on the rails of the railroad. Some of the caterpillars were about one-third grown, some were nearly mature, while a few were hanging pendant, like fruit, preparatory to pupation. All about one could hear the incessant rattle of their feeding, and the patter of their falling excrement like the patter of summer rain. The ground was covered with excrement. Thousands of the cast skins were to be seen on the naked branches. Where the railroad train had been blocked countless thousands of the dead and crushed caterpillars were found, their bodies covering the ground for rods. In the midst of this field of devastation stood willows, pines, roses, firs, tamaracks, grasses and lupines all untouched. Just as I was leaving the place, I noticed that the ground was covered with caterpillars, all crawling in the same direction. I found that they had completely defoliated the ceanothus bushes where they had been and were now on their way to find other food.

Two days later, in Spokane, I found a few acres of ceanothus on a hill side completely defoliated as at Clayton. Here many of the caterpillars had transformed to chrysalids. Several times they were noticed to shake themselves violently until the bushes shook from the effect.

On July 7 I found millions of the caterpillars on the south slope of Moscow Mt., Idaho. Some of these were parasitized by an undetermined species of Braconid.

On July 13, when I again visited the place of infestation at Moscow Mt., I found that all caterpillars and all chrysalids were gone. The caterpillars had evidently not migrated, for all around as far as I could see the ceanothus had not been touched. Even had the caterpillars migrated that would not explain the absence of the chrysalids. I think that the total disappearance of these caterpillars and chrysalids was no doubt due to birds. A similar disappearance of all the caterpillars in the other districts visited seems to confirm this opinion.

These caterpillars were reported from the following places: Chelan, Wn.; Brownsville, Wn.; Moscow Mt., Idaho; Nelson, B.C.; Peachland, B.C., and Clayton, Wash. M. A. YOTHERS.

## NOTE ON THE OVIPOSITION OF *AEDES CALOPUS* MEIGEN.

BY JAMES ZETEK, ANCON, CANAL ZONE.

The writer was taking the adults from a lot of breeding cages and, by accident, one female *Aedes calopus* escaped. Hardly more than two minutes later he turned his attention to an uncovered cage containing water and larvæ of *Culex coronator* D & K, and discovered a mosquito resting on the side of the jar, the tip of its abdomen extending and touching the water, depositing eggs. This occurred at 4.10 p.m., July 2nd, 1913. The mosquito was *A. calopus*, and most probably was the one that had escaped a moment before. The cage was covered with gauze.

When the cages were examined at 1.00 a. m., July 5th, very young larvæ of the yellow-fever mosquito were seen in this particular jar. The egg instar is about 60 hours. These larvæ were allowed to mature, and from them emerged 14 ♀ and 18 ♂ adults.

The female which had deposited these eggs had no blood meal, nor any other food than which was present in the air and water. In the original cages of *Aedes calopus*, copulation was frequently noted, occurring chiefly in the daytime. In the act the male is underneath, clasping the female, the two mosquitos facing each other. The male clasped the female as frequently in flight as when at rest. In one cage, containing one male and many females, the male copulated three successive times during the half hour under observation.

The rapidity with which the mosquito found water suitable for oviposition after its escape is remarkable, and places emphasis upon the cautions to be taken while working with disease-transmitting insects or pests.

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## PHLEBOTOMUS AND VERRUGA.

It would appear that an addition is likely to be made to the ever-increasing number of cases of the relation of insects to disease. In certain of the valleys of the Pacific slope of the Peruvian Andes,

in South America, an obscure disease, known as *Verruga*, has existed for years. Recently, the possibility of the transmission by some species of insect, or tick, has been seriously entertained, and we now learn from "Science" (August 15th, 1913) that Mr. Charles H. T. Townsend, who was some time ago especially charged by the Peruvian Government with the investigation of the insect transmission of verruga, injected a dog with triturated females of *Phlebotomus* on July 11th, and on July 17th secured as a result an unmistakable case of verruga eruption. The gnats used for the injection were secured on the night of July 9th, in Verrugas Canyon, a noted focus of the disease. This is the first experimental transmission of verruga by means of insects, and adds a notable case to the list of insect-borne diseases. The details of the experiment will appear shortly. Further transmission work in laboratory animals will be pursued at once, both by injections and by causing the gnats to bite. C. G. H.

## A NEW LEPTODESMID FROM MONTANA.

BY RALPH V. CHAMBERLIN, CAMBRIDGE, MASS.

The following description is published separately in order that the name may be available for early use.

*Leptodesmus* (*Chouaphe*) *elrodi*, sp. nov.

Light brown to very deep brown and brownish black, the background sometimes rather obscurely chestnut. Carinal and anal process in darker individuals orange, in paler even more yellowish; the first dorsal plate also paler, yellowish, oblong anterior margin. The metazonites may be be paler caudally.

Head with the median sulcus deep. Vertex moderately finely uneven or coriaceous, bearing several long bristles across vertex and also in clypeal region above those of labial border. Antennæ of moderate length. First or cervical dorsal plate narrower than the second one, anteriorly strongly convex; caudal margin moderately deeply concave mesally; laterally margined. Caudolateral angles with caudal side nearly straight. Dorsum strongly arched; anterolateral corners of plates convexly rounded, in the second to fifth plates a little extended cephalad, but in others more and

more sloping off caudad. Caudal corners in about the second to the eighth plates bent moderately forward, then becoming straight in a few and then bent caudad, and in the last few forming a distinct but always distally rounded process; edges of lateral carinæ narrowly elevated; pores opening ectad; nineteenth plate much shortened, its processes reduced; metazonites with transverse furrow distinct; surface to naked eye appearing nearly smooth and shining, under the lens finely coriaceous, more strongly roughened laterally. Sternites smooth, glabrous. A deep transverse sulcus at middle and a weaker median longitudinal one crossing it at right angles. Anal process in dorsal outline subtriangular, distally subcylindric, the tip a little depressed; a transverse row of four bristles near middle of length and toward and on tip about eight more. Anal scale semilunar in outline, but with the anterior margin weakly convex, bearing a bristle on each side a little in front of caudal margin. Anal valves elevated along mesal border, each bearing a bristle a little ectad of mesal edge near middle of length and a second one in line with it farther caudad. Legs clothed with stiff hairs, which proximally are sparse, but distally, and especially on dorsal surface, become more dense and at the same time shorter. Male gonopods consisting of two long prongs, of which the posterior one is distally slender and style-like and curves evenly, first dorsal and somewhat mesad and then back proximad. The anterior branch just proximad of the curve in the first one expands into a subtriangular plate on the dorsomesal side, which along its distal or caudal edge bears several short teeth, of which the one at angle is the longest; the prong continues beyond this on a more slender blade which bends abruptly dorsad or dorso-ectad and bears on its proximal edge and mostly on distal portion a series of long, curved, spine-like processes. (See fig. 17).

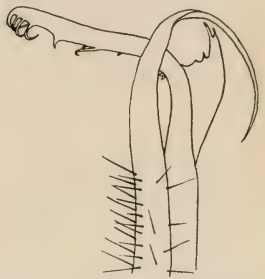

Fig. 17.—*Leptodesmus elrodi*, caudo-ventral view of distal portion of right male gonopod.

*Locality.*—Montana (Flathead Lake).

The specimens forming the types of this species were collected by Dr. C. C. Adams in the summer of 1912. The species is named in honour of Prof. Morton J. Elrod, of the University of Montana, who is doing much in aiding the advancement of our knowledge of the Natural History of Montana.

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## A NEW PAMPHILA FROM NEW MEXICO (LEPIDOPTERA).

BY HENRY SKINNER, M.D., SC.D.

*Pamphila margarita*, n. sp. The male expands 14.5 mm. and the female 15.5 mm., the measurements being taken from the base to the apex of one wing. The colour of the species is tawny olive (Ridgway) and the same colour as *pittacus* Edwards. There is a very faint stigma in the male and on the primaries three vitreous subapical spots; a rectangular spot, constricted in the middle, at the end of the discoidal cell; three spots in an oblique line across the median interspaces, the middle one being the largest and triangular in shape, and the lower one is somewhat linear, with the inner end pointed. The secondaries have a crooked transverse row of four vitreous spots below the middle of the wing; the lower two are small and parallel to the margin, while the upper two are the larger and at right angles to the margin. Fringe dirty white. Underside: Primaries with the spots repeated and also on the secondaries, but larger, and there are in addition a few spots at the base of the wing. The female is like the male, but larger, and the spots are more conspicuous.

This species is allied to *pittacus* Edw. and looks much like it. The transverse row of spots on the upper side of the secondaries of *pittacus* consists of four, straight, distinct rectangular spots, and the two species may be separated by the difference in this row of spots.

Described from a number of specimens of both sexes submitted by Mr. R. C. Williams, the species being named in honour of his wife. They were captured at Jemez Springs, New Mexico, May 26th to June 9th, by Mr. John Woodgate. The type is in the collection of the Academy of Natural Sciences of Philadelphia.

## A NEW SPECIES OF ELASMIDÆ OF THE GENUS *EURYISCHIA* HOWARD FROM AUSTRALIA, AND A NEW *PODAGRIONELLA*.

BY A. A. GIRAULT, NELSON, N.Q., AUSTRALIA

The following species has, in my own mind, served to confirm the position of *Euryischia* Howard in the family Elasmidæ. It was captured with the sweeping net January 6th, 1913, from foliage and grass along the Cape River, Capeville, Pentland, Queensland.

Genus *Euryischia* Howard.

1.—*Euryischia sumneri*, new species.

*Female.*—Length 2mm.

Black-blue, the distal third or more of the fore wing distinctly embrowned (from about distal fourth of marginal vein to the apex); postmarginal vein somewhat longer than the long stigmal, and over half the length of the marginal. Cephalic tibiæ and tarsi brownish, also the tegulæ; caudal coxæ normal for the family, but the caudal femora enlarged and compressed. Scutellum finely alutaceous, the scutum the same but clothed with dense, black, stiff bristles. Antennæ yellowish, club 3-jointed, funicle 3-jointed, the distal joint wider than long; the first subquadrate, the club ovate, larger than the funicle; no ring-joint. Both mandibles tridentate, the inner tooth broad and truncate, shorter. Pedicel longer than any of the funicle joints. Forewings proximad with several very long bristles from the blade. Posterior tibial spurs white.

(From one specimen, $\frac{2}{3}$-inch objective, 1-inch optic, Bausch and Lomb.)

*Male.*—Not known.

*Habitat.*—Australia—Capeville (Pentland), Queensland.

*Type.*—In the Queensland Museum, Brisbane, the above specimen on a tag plus a slide bearing the head.

Dedicated with much respect to Charles Sumner for his orations on war.

Genus *Podagrionella* Girault.

1.—*Podagrionella pentlandensis*, new species.

*Female.*—Length 5.10 mm., exclusive of ovipositor.

Very similar to the type of the genus, but the antennal club darkens at tip, the flagellum reddish brown, the pedicel darker.

The abdominal petiole is shorter, very short, wider than long; the distal two funicle joints are slightly wider than long; the cross dash on the fore wing is the only fuscation present in these wings. The whole body is more robust, the abdomen stouter and longer. Otherwise structurally like *fasciatipennis*, with which I have compared it. Mandibles tridentate.

*Male.*—Not known.

Described from one female captured by sweeping miscellaneous foliage and grasses along the Cape River, Capeville, Pentland, Q., January 6th, 1913.

*Habitat.*—Australia—Queensland, Capeville (Pentland).

*Type.*—In the Queensland Museum, Brisbane, the above specimen on a tag with a slide bearing posterior femur and head.

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## CONSTITUTION OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

Incorporated 1871.

SECTION I.—(OBJECTS AND MEMBERSHIP).

1.—The Society shall be called "THE ENTOMOLOGICAL SOCIETY OF ONTARIO," and is instituted for the investigation of the character and habits of insects, the improvement and advancement of Entomological Science, and more especially its practical bearing on the Agricultural and Horticultural interests of the Province. The Society shall consist of not less than twenty-five members.

2.—The Society shall consist of four classes, viz.—Members, Life Members, Honorary Members and Corresponding Members.

3.—Members shall be persons whose pursuits, or studies, are connected with Entomology, or who are in any way interested in Natural History and who are resident within the Dominion of Canada.

4.—Life Members shall be persons who have made donations to the value of $25 in money, books or specimens (the two latter to be valued by competent persons) or who may be elected as such at the General Meeting of the Society, for important services performed, and after due notice has been given.

5.—Entomologists residing outside Canada may be elected Corresponding Members of the Society, but such membership will not entitle them to the publications of the Society except on payment of the subscription to the Journal of the Society.

6.—Honorary Members shall be members of high standing and eminence for their attainments in Entomology.

7.—The number of Honorary Members shall be limited to twenty-five.

8.—The Officers of the Society shall consist of a President, a Vice-President, a Secretary-Treasurer, and not fewer than three, and not more than five, Directors, to form a Council; all of whom, with two Auditors, shall be elected annually at the Annual General Meeting of the Society, and shall be eligible for re-election. The said Council shall, at their meeting, appoint a Curator.

SECTION II.—(ELECTION OF MEMBERS).

1.—All candidates for Ordinary or Life Membership must be proposed by a member at a regular meeting of the Society and be balloted for; the affirmative vote of three-fourths of the members present shall be necessary for the election of a candidate.

2.—Honorary Members must be recommended by at least three members, who shall certify that the person named is eminent for his Entomological attainments; the election in their case shall be conducted in the same manner as laid down for other members.

3.—Corresponding Members shall be elected in the same manner as Honorary Members.

4.—Whenever any person is elected a member in any class, the Secretary shall immediately inform him of the same by letter, and no person shall be considered a member until he has signified his acquiescence in the election.

5.—Every person elected a member is required to pay his first contribution within one month of the date of his election; otherwise his election shall be null and void.

SECTION III.—(CONTRIBUTIONS).

1.—The annual contribution of members shall be one dollar; all contributions to be due in advance on the first day of January in each year, the payment of which shall entitle the member to a copy of all the publications of the Society during the year. All

new members, except those elected at and after the Annual General Meeting and before the following first of January, shall be required to pay the subscription for the year in which they are elected.

2.—Every member shall be considered to belong to the Society, and as such be liable to the payment of his annual contribution, until he has either forfeited his claim or has signified to the Secretary, in writing, his desire to withdraw, when his name shall be erased from the list of members.

3.—Whenever any member shall be one year in arrear in the payment of his annual contribution, the Secretary shall inform him of the fact in writing. Any member continuing two years in arrears shall be considered to have withdrawn from the Society, and his name shall be erased from the list of members.

4.—Life and Honorary Members shall be required to pay an annual contribution.

SECTION IV.—(OFFICERS).

1.—The duties of the President shall be to preside at all the meetings of the Society, to preserve good order and decorum and to regulate debates.

2.—The duties of the Vice-President shall be the same as those of the President during his absence.

3.—The duties of the Secretary-Treasurer shall be to take and preserve correct minutes of the proceedings of the Society, and to present and read all communications addressed to the Society; to notify members of their election, and those in arrear of the amount of their indebtedness; to keep a correct list of the members of the Society, with the dates of their election, resignation or death and their addresses; to maintain the correspondence of the Society, and to acknowledge all donations to it. He shall also take charge of the funds of the Society and keep an accurate account of all the receipts and disbursements, and of the indebtedness of the Members, and render an Annual Report of the same at the Annual General Meeting of the Society, in the manner required by the Act respecting the Board of Agriculture and Arts.

4.—It shall be the duty of the Curator to take charge of all books, specimens, cabinets, and other properties of the Society; to keep and arrange in their proper places all donations of specimens;

to keep a record of all contributions of books and specimens, with a list of the contributors; and to oversee and direct any exchange of specimens. He shall also report annually to the Society on the condition of the specimens and cabinets under his care.

5.—The Officers of the Society shall form a Council who shall have the direction and management of the affairs of the Society. The Council shall meet once in every quarter, the time and place of meeting to be appointed by the President, and notice to be given by the Secretary at least ten days beforehand.

6.—The Council shall draw up a Yearly Report on the state of the Society, in which shall be given an abstract of all the proceedings, and a duly audited account of the receipts and expenditure of the Society during their term of office; and such report shall be read at the Annual General Meeting.

SECTION V.—(MEETINGS).

1.—Ordinary Meetings shall be held once a month, on such days and at such hour as the Society by resolution may from time to time agree upon.

2.—The Annual General Meeting of the Society shall be held at the place and during the same time as the Exhibition of the Agricultural and Arts Association is being held in each year, to receive and deliberate upon the Report of the Council on the state of the Society, to elect Officers and Directors for the ensuing year and to transact any other business of which notice has been given.

3.—Special Meetings of the Society may be called by the President upon the written request of five members of the Society, provided that one week's notice of the meeting be given, and that its object be specified.

SECTION VI.—(BRANCHES OF THE SOCIETY).

1.—Branches of the Society may be formed in any place within the Dominion of Canada on a written application to the Society from at least six persons resident in the locality.

2.—Each Branch shall be required to pay to the Parent Society fifty cents per annum for each paying member on its list.

3.—Every Branch shall be governed by the constitution of the Society, but shall have power to elect its own officers and enact by-laws for itself, provided they be not contrary to the tenor and spirit of the Constitution of the whole Society.

4.—All Members of the Branches shall be Members of the Society and entitled to all the privileges of Members.

5.—No Corresponding or Honorary Member shall be appointed by the Branches, but such members may be proposed at General Meetings of the Society by any Branch as well as by the individual members.

6.—Each Branch shall transmit to the Parent Society, on or before the first of September each year, an Annual Report of its proceedings, such report to be read at the Annual General Meeting.

SECTION VII.—(ALTERATION OF CONSTITUTION).

1.—No article in any section of this Constitution shall be altered or added to, unless notice be first given at an Ordinary Meeting of the Society, or of a Branch, and the alteration or addition be sanctioned by two-thirds of the members present at the next ensuing meeting; the Secretary of the Society, or of the Branch, shall then notify the Secretaries of all the other Branches; when the sanction of all the Branches has been obtained in the same manner, the alteration or addition shall become law.

SECTION VIII.—(SUBSCRIPTION PRICE OF MAGAZINE).

The Annual Subscription Price of the CANADIAN ENTOMOLOGIST shall be two dollars ($2.00), postage included, payable in advance. Members of the Society who have paid their annual dues shall receive the Magazine free of charge, as stated in Section III, Clause I, of the Constitution of the Society.

Mailed December 19th, 1913.

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